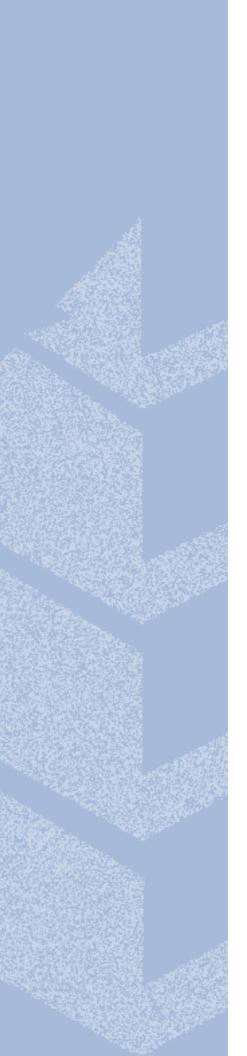
# AIDSTREATCOST MODEL USER'S MANUAL

JULY 2003





# AIDSTREATCOST MODEL USER'S MANUAL

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July 2003

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Partners for Health Reformplus is USAID's flagship project for health policy and health system strengthening in developing and transitional countries. The five-year project (2000-2005) builds on the predecessor Partnerships for Health Reform Project, continuing PHR's focus on health policy, financing, and organization, with new emphasis on community participation, infectious disease surveillance, and information systems that support the management and delivery of appropriate health services. PHRplus will focus on the following results:

- Implementation of appropriate health system reform.
- $\bullet$  Generation of new financing for health care, as well as more effective use of existing funds.
- Design and implementation of health information systems for disease surveillance.
- Delivery of quality services by health workers.
- Availability and appropriate use of health commodities.

July 2003

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The opinions stated in this document are solely those of the authors and do not necessarily reflect the views of USAID.

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# QUICKSTART: SETTING UP THE COMPUTER AND COPYING FILES

The AIDSTREAT COST Model (ATC) is a software tool that estimates the costs associated with user-specified policies for treating HIV/AIDS. The Program must be copied onto your computer or network server – it cannot be run from the CD. Please read and review the following QuickStart Section to ensure you get started. You may open or print the User's Manual from the CD if you prefer. Section 1.4 and 2.1 outline how to get started.

### I. How to Set Up Your Computer to Use the ATC

The ATC will run on any computer using the Windows operating system. Installing the ATC is explained in detail in Chapter 2 of the User's Guide.

Running the ATC requires:

- Any personal computer running the Windows operating system,
- A monitor capable of having its screen resolution set to 1024 by 768 pixels, and
- Sufficient memory to create a directory structure for the ATC.

To set the screen resolution to 1024 by 768, proceed as follows.

- Select Start typically, the Start button will be at lower left on your screen. Then select Settings, Control Panel and Display. Windows will appear as it does below.
- Once you select Display, Windows will generate the Display Properties screen
- In the Display Properties, select the tab titled "Settings" which will then display the setting screen.
- Set the Screen Area to 1024 by 768 by placing the cursor on the downward arrow between Less and More. Depress the mouse button and hold it in depressed position. Move the cursor left or right to obtain the required setting.

# 2. Installing the ATC: Setting up the ATC Directory Structure

In order to use the ATC, you need to create a directory structure for it. To install the ATC on your computer's hard drive:

- 1. In Windows Explorer, create a directory c:\ATC. To do this:
- In Windows Explorer, highlight OS (C:), then
- 2. Select File
- 3. Highlight New
- 4. Select Folder, and
- 5. Enter the name ATC for the folder.
- 6. Copy the ATC executable file, atc.exe, to this directory.
- 7. Again using Explorer, create two subdirectories within c:\ATC:
  - a) c:\ATC\help, and
  - b) c:\ATC\images.
- 8. Copy all help pages into the subdirectory c:\ATC\help. There are 47 of these files.
- 9. Copy the files, <background.bmp>, <splash.bmp>, and <seal.bmp> into the directory c:\ATC\images.
- 10. The ATC will create all other subdirectories as it requires them.
- 11. You may wish to create the subdirectory c:\ATC\Data now even if you will not use it now. This is where you will save data in Excel format for use with the ATC. If you do not choose to create this directory, the ATC will do so the first time you *Export* data.
- 12. Once you have created c:\ATC\help and c:\ATC\images, double click on atc.exe to start the ATC.

When you begin to run the ATC, the first screen to appear introduces the model. Please refer to Chapter 2 of the User's Manual for further guidance.

#### **ACRONYMS**

AIDS Acquired Immunodeficiency Syndrome

**ARV** Antiretroviral

ATC AIDSTREATCOST Model

**CSV** Comma delimited (.csv)

**HIV** Human Immunodeficiency Virus

MTCT Mother to Child Transmission

NNRTI Non-Nucleoside Reverse Transcriptase Inhibitors

NRTI Nucleoside Reverse Transcriptase Inhibitors

**OI** Opportunistic Infections

**PHR***plus* Partners for Health Reform*plus* Project (USAID)

**PI** Protease Inhibitors

**USAID** United States Agency for International Development

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Several HIV/AIDS service delivery and health financing experts provided feedback on the initial development of the ATC model at a meeting on May 9, 2002, in Washington, D.C. These experts and contributors to the framework and model include: Melissa Barrett, Academy for Educational Development; Lori Bollinger, The Futures Group International; Lilani Kumaranayake, London School of Hygiene and Tropical Medicine; Elizabeth Lewis and Suzanne Thomas, Rational Pharmaceutical Managementplus Project at Management Sciences for Health; Ann Levin, the Horizons Project; Ernest Massiah, InterAmerican Development Bank; Mead Over and Renee Bonille, World Bank; Eric van Praag and Mukadi Ya Diul, Family Health International; Karen Cavanaugh, Kate Crawford, Marni Sommer, and David Stanton from USAID.

#### INTRODUCTION

As a result of growing national and international pressure to make ARV treatment available, most low resource countries have started to provide antiretroviral (ARV) treatment to people living with HIV/AIDS. However, limited information exists on the costs of providing a comprehensive ARV treatment program, including necessary health facility infrastructure, and staffing requirements as well as drugs and supplies. As a result, the Partners for Health Reformplus project (PHRplus) developed the software tool, AIDSTREATCOST (ATC), to estimate the total costs of a national ARV treatment program. The tool is designed to provide a basis for policy decisions, program planning and budgeting for ARV treatment. The model can also facilitate the development of financing strategies for ARV treatment in resource poor settings.

The purpose of the ATC manual is to guide low resource health policy planners and technicians step-by-step through the model in order to build and modify various ARV treatment scenarios and to compare policy options and their respective costs. The user is required to enter demographic, epidemiological, medical, and cost data, as well as information on ARV drug conflicts. Once these data are entered, users can create policy scenarios for treating given subset of the country (e.g., HIV+ pregnant women and infants) and examine the respective costs for various treatment options.

The target audience for the results and findings of the model are national-level health policy planners, HIV/AIDS experts, Ministries of Health and Finance, national AIDS coordinating agencies, program planners, donors, civil society groups and other stakeholders concerned with crafting and implementing ARV treatment policy and protocols.

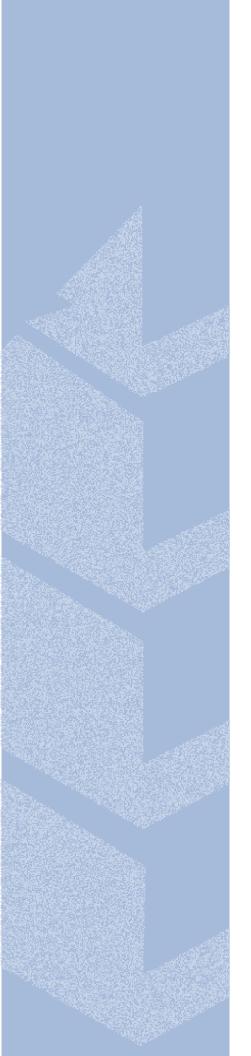
The target audience for use of the manual and the model are Ministry of Health and Finance technicians or local health professionals. Based on PHRplus experience piloting the use of the model and manual in high-prevalence countries in sub-Saharan Africa, the project envisions a county team of two to three health professionals gathering and inputting data and building treatment scenarios, producing cost estimates and comparisons of various scenarios, particularly comparing estimated resources required with existing country resources. Optimal use of the model and manual requires user familiarity with computer programs, country-level data on the country's existing health infrastructure and costs, demographic data, epidemiological data on HIV/AIDS, and an understanding of the cost components of ARV treatment systems.

Resources required for ATC use include the following:

- Disk space, CD reader, printer and mouse;
- Microsoft Office 2000, including Excel;
- Screen resolution set to 1024 by 768 pixels; and,
- Directory structure for the ATC.

The manual walks the user through the model step-by-step and illustrates how to build and compare various ARV policy scenarios. Since this is the first version of the model and manual, the authors welcome your feedback and suggestions for further improving their user-friendly operation.

The manual contains 15 chapters, beginning with an overview and introduction to the software model and proceeding through the required baseline data entry steps (inputting demographic, epidemiological, medical, cost and drug conflict information); creating and modifying treatment policy scenarios; viewing scenario output, such as total cost by input; and highlighting constraints to treatment scenarios.



### CHAPTER I OVERVIEW OF THE ATC

- 1.1 The ATC Model
- 1.2 Components of the ATC
  - 1.2.1 The Baseline Data Editor
  - 1.2.2 The Scenario Editor
  - 1.2.3 View Scenario Output
- 1.3 How the ATC Estimates the Costs of an ARV Treatment Program
  - 1.3.1 Estimating Total Cost
  - 1.3.2 Estimating the Number of Persons Treated
  - 1.3.3 The Per Person Cost of Treatment
- 1.4 How to Set Up Your Computer to Use the ATC

# CHAPTER I OVERVIEW OF THE ATC

The AIDSTREATCOST Model (ATC) is a software tool that estimates the costs associated with user-specified policies for treating HIV/AIDS. In recent years, the price of Zidovudine (AZT) and other drugs used for treating HIV/AIDS have declined. In response, countries not already treating their AIDS populations have begun designing programs to provide antiretroviral (ARV) therapy. But the total cost of a program for treating AIDS may be much greater than the cost of drugs alone. This total cost is what the ATC estimates.

#### I.I THE ATC MODEL

In order to estimate the costs associated with a national HIV/AIDS treatment program, the ATC must take account of the demographics of a country—e.g., the size of its population, and how the population is distributed by age, gender, and location. It must also account for the epidemiology of HIV/AIDS in that country—e.g., how many persons are infected with HIV, and how fast individuals with HIV progress to AIDS. Finally, the ATC must assign costs to elements of a treatment program. The ATC thus includes:

- A model of the demographics in the country of interest,
- A model of the epidemiology of HIV/AIDS in the same country, and
- A model, or set of algorithms, that the ATC uses to estimate costs and resources requirements associated with a specified policy for treating HIV/AIDS.

The demographic model begins with an initial population distributed by age, gender, location (urban/rural) and HIV status (HIV-, HIV+, and Symptomatic AIDS). It ages people over time, adds population using an assumed fertility rate, and subtracts population using an assumed non-AIDS mortality rate.

The epidemiological model is dynamic as well. It adds people to the HIV+ population using assumed infection rates. It also changes individuals' HIV status, using an assumed symptom development rate to move them from the category of those who are HIV+ to the category of those with Symptomatic AIDS. The epidemiological model also subtracts population using a background mortality rate in conjunction with a mortality rate for those with AIDS. Finally, the ATC's epidemiological model allows users to

assume that treatment decreases the AIDS mortality rate and the rate at which mothers transmit HIV to their newborn infants. In these ways, the ATC adjusts for the effectiveness of treatment.

The cost algorithms use demographic, epidemiological, and cost data to estimate financial and other resource costs associated with user-specified policies for treating HIV/AIDS in the country of interest. These include, for example, the total and per person costs of treatment, as well as the size of the health care workforce required by a specified treatment policy.

#### 1.2 COMPONENTS OF THE ATC

The ATC has, essentially, three components:

- The Baseline Data Editor:
- The Scenario Editor; and
- The View Output Function.

#### 1.2.1 THE BASELINE DATA EDITOR

In order to estimate the cost and other implications of a specified policy for treating AIDS in a given country, you need to tell the ATC what the country is like. You do this using the *Baseline Data Editor*. Here, you enter, several types of data for the country of interest:

- Demographic data These data describe the size of the population and its distribution by age, gender, location (urban/ rural), and HIV status.
- Epidemiological data These describe the HIV infection rate, the AIDS symptom development rate, the rate at which mothers transmit HIV to their unborn children, the prevalence of opportunistic infections, and the AIDS mortality rate.
- Medical data These describe the country's medical infrastructure as it pertains to treating HIV/AIDS. The data include types of health facilities; types of health care staff; screening tests, and protocols for treating AIDS, opportunistic infections, and mother to child transmission.
- Cost data These indicate the cost of labor (health care staff), capital (e.g., health facilities), and variable costs associated with treatment protocols.
- Assumptions regarding drug conflicts These indicate which AIDS drugs cannot be given in combination.

Taken together, these data describe the demographics, epidemiology, medical infrastructure, and financial environment that any policy for treating HIV/AIDS would confront. Indeed, it is useful to think of the data as defining a universe of possible programs for treating HIV/AIDS for the country of interest.

#### 1.2.2 THE SCENARIO EDITOR

The ATC helps evaluate the financial costs, human resources, and other resources needed for treating HIV/AIDS in a country of interest to you. The Scenario Editor is where you define policies for the ATC to evaluate. In the language of the ATC, these policies are ARV treatment scenarios. In brief, the Scenario Editor requires you to choose:

- A Baseline Data Set This defines the policy environment of the scenario that you define.
- A set of Eligible Populations This indicates which populations are eligible for treatment, the treatments for which they are eligible, and where they receive care.
- A Screening Protocol This includes the screening and confirmation tests that would be used in the scenario that you specify, as well as the staff time that each test requires.
- Protocols for treating AIDS, Opportunistic Infections, and Mother to Child Transmission of HIV This includes the treatment and testing protocols that eligible populations receive, as well as the time that each requires from each type of health care staff.
- Mortality Reduction and Reduction in MTCT The ATC assumes that treating AIDS and opportunistic infections will have the effect of lowering the mortality rates among the symptomatic population so the ATC allows you to indicate the degree to which ARV therapy, and treatment of opportunistic infections lowers the risk of death. The ATC also allows users to indicate the degree to which treatment affects the likelihood that an HIV+ mother will transmit the virus to her newborn child.

#### 1.2.3 VIEW SCENARIO OUTPUT

Once you have finished defining a treatment program—that is an ATC scenario—the ATC will evaluate its cost, resource, and other implications. You will view ATC estimates using the View Scenario Output function. This will permit you to display a wide range of ATC estimates in either tabular or graphical form.

### I.3 How the ATC Estimates the Costs of an ARV Treatment Program

The primary purpose of the ATC is to help policymakers estimate the costs associated with treating HIV/AIDS.

#### 1.3.1 Estimating Total Cost

This section briefly summarizes how the ATC estimates these costs.

The ATC estimates the total annual cost of a national HIV/AIDS treatment program using data by which users specify which populations are eligible for treatment, and which treatments they may receive. The model derives this cost by working through the following series of steps.

- For each eligible population and each treatment for which they are eligible, it estimates the number of people who will receive treatment.
- For each eligible population and each treatment for which they are eligible, it estimates the per person cost of treatment.
- For each population and treatment, it multiplies the number treated by the per person cost.
- It sums across eligible populations and treatments to get total cost.

The total cost of a program is thus the per person cost of treatment multiplied by the number treated, summed across all eligible populations and treatments.

#### 1.3.2 Estimating the Number of Persons Treated

For a given year, the ATC estimates the number treated for each population that users specify as eligible. The number actually treated typically will be much less than the total eligible population. This is true, for example, because not everyone will have access to care, and not everyone who has access will both need and accept treatment. Generally, for an eligible population, the ATC estimates the number treated in a given year as follows

- Multiply the total number of individuals eligible for a given treatment by the percent of that population with access to health care.
- Multiply the number of persons with access by the percent who have been diagnosed as needing treatment.
- Multiply the number of persons who have access and need treatment by the percent of those who will accept treatment.

In other words, the total number treated will be those who are eligible, have access, and accept treatment.

#### 1.3.3 THE PER PERSON COST OF TREATMENT

The ATC estimates the per person cost of treatment for each eligible population and type of treatment. In any ATC scenario treatment protocols are fixed across eligible population. For example, all populations eligible for ARV therapy are assumed to receive the same combination of drugs. Per person costs can vary between eligible populations, however, because some

populations will receive treatment in more (rather than less) expensive facilities. Capital costs, in other words, are part of the per person cost of treatment.

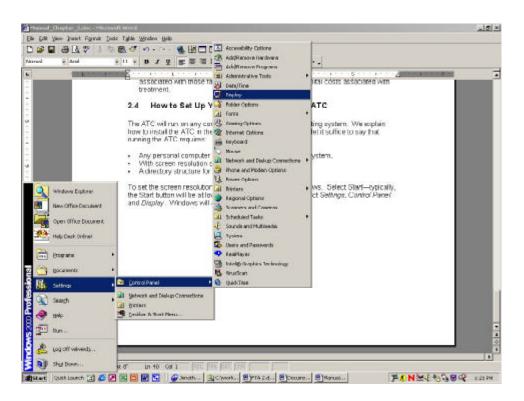
- The per person cost of treatment for a given eligible population, therefore, is determined by:
- The per person cost of the treatment protocols—i.e. of drugs, tests, equipment, and labor, and
- The distribution of eligible populations across facilities and the costs of construction associated with those facilities. This helps determine capital costs associated with treatment.

### I.4 How to SET UP Your Computer to Use the ATC

The ATC will run on any computer using the Windows operating system. Installing the ATC is explained in more detail in Chapter 2. Briefly, running the ATC requires:

- Any personal computer running the Windows operating system,
- With screen resolution set to 1024 by 768 pixels, and
- A directory structure for the ATC (see the picture below).

To set the screen resolution to 1024 by 768, proceed as follows. Select *Start*—typically, the Start button will be at lower left on your screen. The select *Settings*, *Control Panel* and *Display*. Windows will appear as it does below.



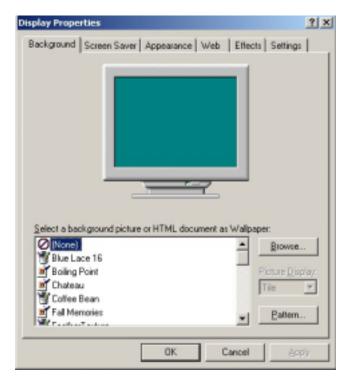
#### Tir

To set the screen resolution to 1024 by 768:
Select Start.
Select Settings.
Select Control Panel.
Select Display. Windows will generate the Display Properties screen.

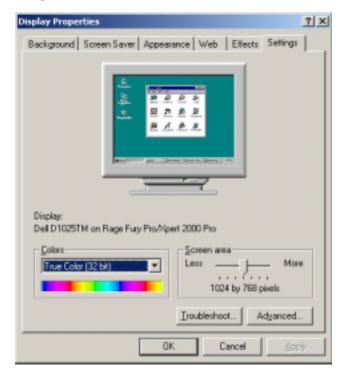
Select the "Settings" tab. Set the Screen Area to 1024 by 768 by placing the cursor on the downward arrow between Less and More. Move the cursor left or right to obtain the required setting. See the QuickStart section for a brief overview on copying

files and getting started.

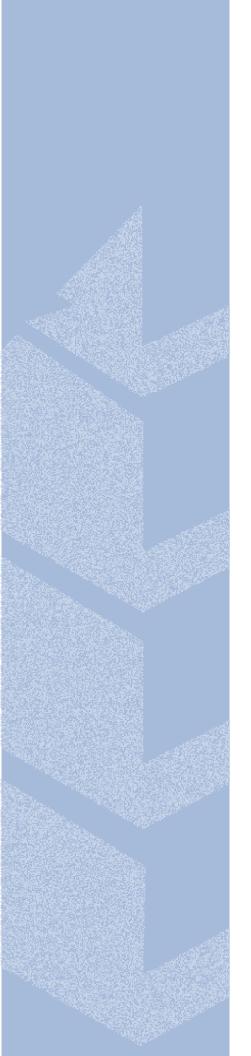
Once you select *Display*, Windows will generate the Display Properties screen:



In the Display Properties, select the tab titled "Settings" which will then display the setting screen:



Set the *Screen Area* to 1024 by 768 by placing the cursor on the downward arrow between *Less* and *More*. Depress the mouse button and hold it in depressed position. Move the cursor left or right to obtain the required setting.



# CHAPTER 2 BEGINNING TO USE THE ATC MODEL

- 2.1 Installing the ATC: Setting up the ATC Directory Structure
- 2.2 Definition of the Options
- 2.3 Baseline Data
- 2.4 Create New Scenario
- 2.5 Modify Existing Scenario
- 2.6 Resume Scenario in Progress
- 2.7 View Scenario Output
- 2.7 Exit and Help

# CHAPTER 2 BEGINNING TO USE THE ATC MODEL

# 2. I INSTALLING THE ATC: SETTING UP THE ATC DIRECTORY STRUCTURE

In order to use the ATC, you need to create a directory structure for it. To install the ATC on your computer's hard drive:

- 1. In Windows Explorer, create a directory c:\ATC. To do this:
- In Windows Explorer, highlight OS (C:), then
- 2. Select File
- 3. Highlight New
- 4. Select Folder, and
- 5. Enter the name ATC for the folder.
- 6. Copy the ATC executable file, atc.exe, to this directory.
- 7. Again using Explorer, create two subdirectories within c:\ATC:
  - a) c:\ATC\help, and
  - b) c:\ATC\images.
- 8. Copy all help pages into the subdirectory c:\ATC\help. There are 47 of these files.
- 9. *Copy* the files, <background.bmp,> <splash.bmp,> and <seal.bmp,> into the directory c:\ATC\images.
- 10. The ATC will create all other subdirectories as it requires them.
- 11. You may wish to create the subdirectory c:\ATC\Data now even if you will not use it now. This is where you will save data in Excel format for use with the ATC. (This is explained below.) If you do not choose to create this directory, the ATC will do so the first time you Export data. (See below.)
- 12. Once you have created c:\ATC\help and c:\ATC\images, double click on atc.exe to start the ATC.

Tip

Be sure to adjust the display settings of the computer monitor yu will use as outlined in section 1.4

#### 2.2 DEFINITION OF THE OPTIONS

When you begin to run the ATC, the first screen to appear introduces the model.



Select *Continue* to proceed. The second screen allows users to select among five options.



- Edit Baseline Data: The ATC model operates on country data and assumptions that you enter. These describe demographic and epidemiological conditions in the country that you want to study. They also define a universe of possible ARV treatment programs for the ATC to evaluate. Enter or edit these data in the Baseline Data Editor. Select Edit Baseline Data to start the Editor.
- Create New Scenario: The Scenario Editor allows you to define or edit an ARV treatment program for the ATC model to evaluate. Select Create New Scenario to use the Scenario Editor.
- Modify Existing Scenario: This selection allows you to modify an existing scenario. When using the ATC, you will create scenarios representing possible ARV treatment programs. Sometimes you will want to compare one scenario with another that differs only slightly (without changing the underlying baseline data). Select Modify Existing Scenario to introduce changes to a scenario that you have created.
- Resume Scenario in Progress: If you are interrupted while
  creating a scenario, select Save Scenario in Progress—this option
  appears on every screen in the Scenario Editor—and exit the ATC.
  When you return to the ATC, select Resume Scenario in Progress.
  The ATC will return you to the point where you ended. This saves
  you from needing to redefine your scenario from the beginning.
- View Scenario Output: Select View Scenario Output to see output from the ATC model calculations. You can view output in report, graphical, or spreadsheet form.

#### 2.3 BASELINE DATA

The ATC is designed to help you evaluate specific programs for providing ARV treatment in a particular country. In order to do this, the ATC first requires data that describe the demographics of the country and the epidemiology of HIV/AIDS in it. The ATC uses those data to model the population and the progress of the disease over time.

In the course of describing the demographics of a country and the epidemiology of HIV/AIDS in that country, the ATC requires you to specify how the ATC stores data. First, it requires you to decide whether to use national data, as opposed to data broken down by urban/rural status. If your data are national, then type Yes in the National Data category. If the data are rural/urban, then type No in this category. Second, the ATC will ask you to define a set of age categories. After setting age categories, data broken down by age will use these categories. Finally, the ATC will ask you to define a set of eligible populations. The ATC will allow you to define an ARV treatment program that treats a specific population only if you have declared it to be an eligible population in the Baseline Data.

Tip

It is useful to think of the Medical Assumptions, Cost Assumptions, and Drug Conflicts as defining the universe of possible ARV treatment programs in the country that you wish to study.

The ATC requires that you enter Medical and Cost Assumptions and that you specify drugs that no individual can receive simultaneously (Drug Conflicts). Medical Assumptions describe the medical infrastructure in the country that you want to study, the kinds of medical staff that could provide ARV treatment, and the treatment protocols that they could use. Cost Assumptions identify the costs of labor, non-durable goods, and capital that an ARV treatment program might employ.

#### 2.4 CREATE NEW SCENARIO

In the ATC model software, a *scenario* is a possible program for treating HIV/AIDS in the country of interest to you. In most cases, there will be more than one possible policy or set of policies that the country might adopt for treating HIV/AIDS. The ATC's *Scenario Editor* allows you to evaluate these one by one and to compare them with one another.

#### 2.5 Modify Existing Scenario

The ATC allows you to compare alternative ARV treatment policies with one another. In the vocabulary of the ATC, treatment policies are called *Scenarios*. A *scenario* is a set of policy decisions regarding:

- Who is eligible for treatment,
- Where they obtain treatment,
- What treatment they receive,
- Who provides treatment and how much time they spend with each patient, and
- How effective treatment is.

One advantage of the ATC is that it allows you to identify the effects of different policy decisions by creating scenarios that differ very little from one another. For example, you might define a treatment program and use the ATC to predict its total cost. Let this be Scenario 1. Afterward you might want to know whether total cost is much affected by the treatment effectiveness assumed in the scenario. Select *Modify Existing Scenario* to change the treatment effectiveness assumed in Scenario 1 and Save the new scenario as Scenario 2. The ATC will now allow you to compare the costs associated with the two scenarios.

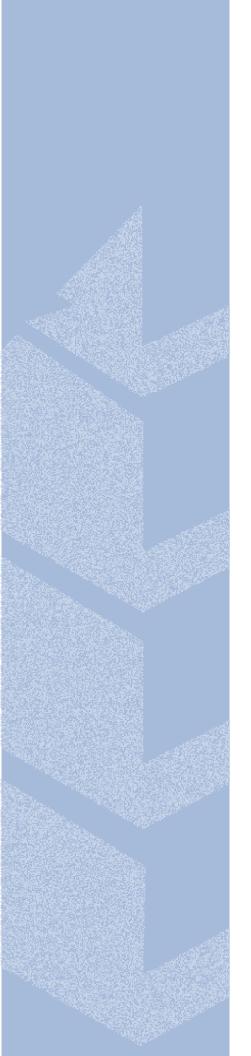
Scenarios take time to define, and you might need to end your ATC session before completing a scenario that you have begun. In order to avoid having to start again at the beginning, the ATC allows you to save a scenario in progress and return to the point where you ended. To do this, select *Save Scenario in Progress* at the end of your session. When you restart the ATC, select *Resume Scenario in Progress*.

#### 2.7 VIEW SCENARIO OUTPUT

After defining an ARV treatment scenario in the *Scenario Editor*, you can view its demographic and epidemiological consequences, as well as its implied costs and resource requirements. Select *View Scenario Output* command to see results of the model's calculations.

#### 2.7 EXIT AND HELP

In the screen above, select *Exit* to leave the ATC model. In any screen of the ATC, select *Help* for advice on how to use that screen.

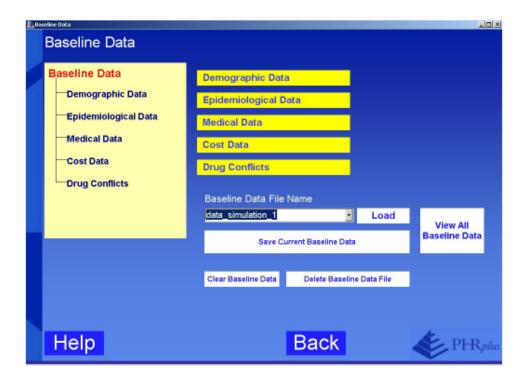


# CHAPTER 3 THE BASELINE DATA

- 3.1 Selecting Baseline Data to Edit
- 3.2 Saving Baseline Data
  - 3.2.1 Using a Saved Data Set
  - 3.2.2 View All Baseline Data
  - 3.2.3 Back and Help
- 3.3 Creating New Baseline Data
- 3.4 Importing Data
  - 3.4.1 Fixed and Variable Length ATC Spreadsheets
- 3.5 Exporting Data
- 3.6 Saving and Importing Data Efficiently

# CHAPTER 3 BASELINE DATA

Select *Edit Baseline Data* from the first screen, entitled AIDSTREATCOST Model, to start the *Baseline Data Editor*.



At left in the Baseline Data screen is a navigation list for your reference of further screens that you can access in the Baseline Data Editor.

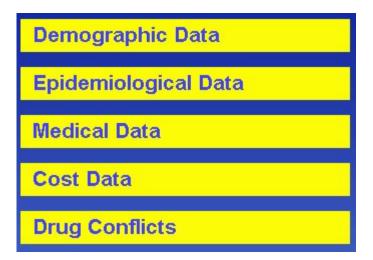


Т

As you proceed through the *Baseline Data*, the ATC program will highlight elements on this navigation list to tell you where you are. This part of the screen has no other function.

#### 3. I SELECTING BASELINE DATA TO EDIT

1. Enter or edit baseline data of a specific type by selecting the relevant option on the *Baseline Data* screen.



There are five sets of *Baseline Data* to enter or edit in the ATC model. Enter or edit these by selecting one of the five areas on the *Baseline Data* screen.

These sets of assumptions are explained in more detail below.

#### 3.2 SAVING BASELINE DATA

1. Save baseline data by typing a name in the space below *Baseline Data Name* in the *Baseline Data* screen and selecting *Save Current Baseline Data*. A confirmation window will appear to confirm that your data has been saved.

Once you have entered or edited data using the *Baseline Data Editor*, you will want to save your data. You can use the saved Baseline Data to evaluate a variety of possible programs for treating HIV/AIDS (using the Scenario editor).



ПP

All screens in the Baseline Data editor include the option Save and Exit. You need to select this option to save data entered on any screen. But, to save the overall set of Baseline Data, select Save Current Baseline Data on the screen above before exiting the Baseline Data Editor. If you have changed an existing data set that you want to preserve, be sure to save the changed data under a new name. If you fail to save your Baseline Data before exiting the program, the ATC model will

save it for you in a file named

"Last Save".

To save a set of Baseline Data, type a file name, such as "data\_simulation\_1," in the space below *Baseline Data File Name* (see example below). After entering a name, select *Save Current Baseline Data*. Your data will be saved in a subdirectory that the ATC model creates. That subdirectory will be named "baseline".

#### 3.2.1 Using a Saved Data Set

1. To use saved Baseline Data set, select the data set by name using the dropdown menu on the Baseline Data screen; then select *Load*.

You might want to use or edit a set of *Baseline Data* that already has been saved. In that case, select the vertical bar (with the inverted triangle). This will produce a dropdown list of saved sets of *Baseline Data*.



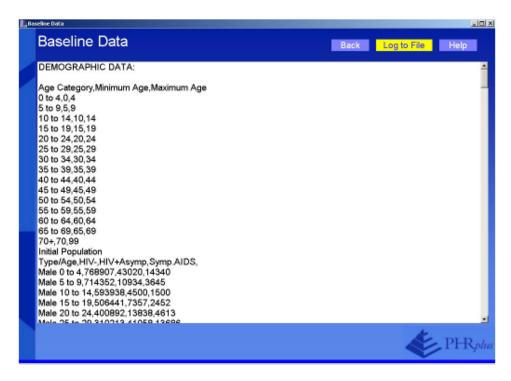
Select the data set that you want, as shown above—the ATC program will highlight it—click on your selection, then select "Load." In the example above, the Baseline Data named "data\_simulation\_1" is being selected.

After selecting a saved set of Baseline Data, you can also delete it by selecting Delete Baseline Data Files.

#### 3.2.2 VIEW ALL BASELINE DATA

- 1. To view an entire saved set of Baseline Data, choose the appropriate name in the dropdown menu in the Baseline Data screen, select *Load*, then select *View All Baseline Data*.
- 2. To view a set of Baseline Data that you have just entered, save the data and select *View All Baseline Data*.

Once you have created a set of Baseline Data, or selected a saved set, you can also view the entire set of saved data, by selecting *View All Baseline Data*. These will appear in an ATC model spreadsheet. The spreadsheet will look like a set of Excel spreadsheets appended together *vertically*, one after the other.

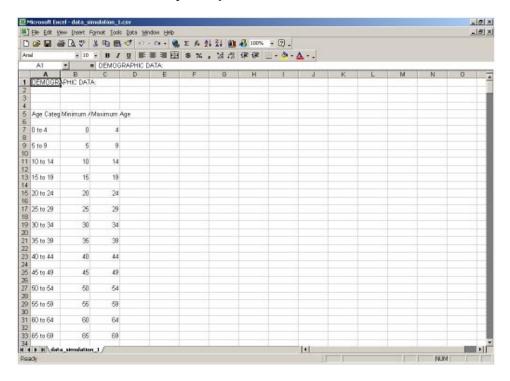


You can also view assumptions by loading a data set and then examining the Baseline Data screen-by-screen.

A third way to view *Baseline Data* is by using Excel. To do this, select *View Baseline Data*, and then select *Log to File*. The ATC will then ask you to name the file to which you will be logging Baseline Data. Type in a name and select *Save*. The ATC will save this in a sub-directory called "Output".

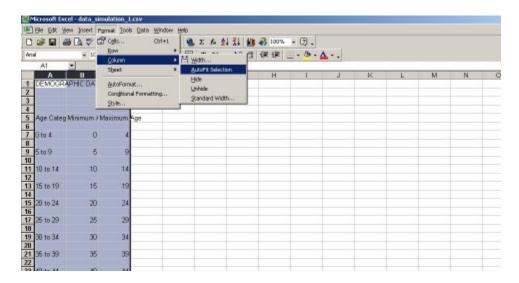


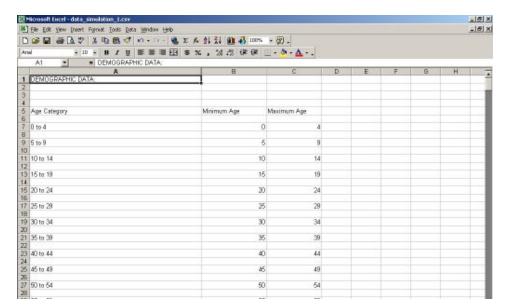
You can then open this file in Excel. It will look like the spreadsheet below or on the next page; At first, this will be difficult to read because the row and column titles are partially hidden.



To ensure that the rows and column titles are not partially hidden:

- 1. Highlight all of the columns with data in them,
- 2. Select Format, Column, and AutoFit Selection.





This will expand the columns to fit the data:

#### 3.2.3 BACK AND HELP

- 1. Select *Back* to return to a previous screen.
- 2. Select *Help* to see information on how to use the screen that you are viewing.

#### 3.3 CREATING NEW BASELINE DATA

- 1. To create a new data set, enter a new Baseline Data File Name in the *Baseline Data* screen and select *Save Current Baseline Data*, then:
- 2. Systematically select each of the five data categories and enter complete data for each.
- 3. As you enter data select Save and Exit to save the data that you enter
- 4. Before leaving the ATC, be sure to select *Save Current Baseline Data* in the *Baseline Data* screen. Your data will be lost otherwise, even if you have saved each screen.

For each country that you consider, you will need to create a baseline data set. You may also create new baseline data sets because you are uncertain that your baseline data are correct, and you want to test the sensitivity of ATC estimates to changes in baseline data. In any case, to create a baseline data set, you begin in the *Baseline Data* screen. Enter a file name and select *Save Current Baseline Data*. This will create an empty data set with a fixed name. To fill in data, select the five data categories one-by-one, and enter data completely as required.

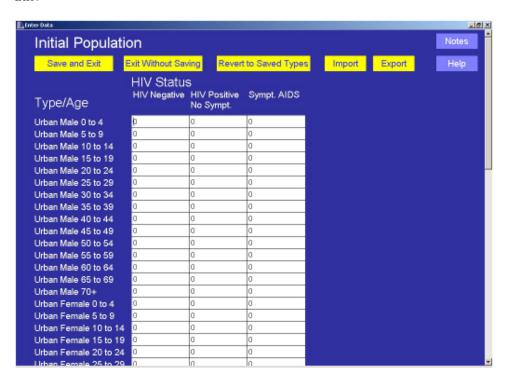
### 3.4 IMPORTING DATA

There are two ways to enter data in the ATC. First you can enter data by hand in the ATC itself. But, frequently, this will be time-consuming. In general, the best way to enter data in the ATC is to record your data first in an Excel spreadsheet and use the *Import* function.

The *Import* function allows you to enter data that you have saved in an Excel spreadsheet. To enter data saved in a spreadsheet:

- Make certain that the Excel spreadsheet is saved in .csv format. If it is not, then open the Excel spreadsheet and re-save it in that format.
- 2. Also make certain that the .csv spreadsheet is in an ATC directory labeled *Data*.
- 3. Then, in the relevant screen of the ATC,
  - a. Select Import,
  - b. Enter the name of your spreadsheet, and
  - c. Select Load.

When you first select *Demographic Data* from the *Baseline Data* screen, the ATC will prompt you to enter data describing the population in the country of interest to you. (This is discussed in more detail below.) Before you enter any data, the ATC screen for data on the population will look like this:



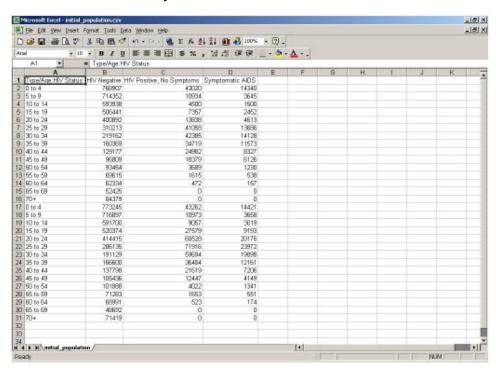
Tip

To save an Excel spreadsheet file in .csv format—i.e. comma separated variables, perform the following steps:

- 1. In Excel, select File.
- 2. Then select Save As.
- In the menu for Save a type, select "CSV" (Comma delimited) (\*.csv).
- 4. Then select Save.

If your data is broken down into single years of age, gender, and urban/rural status, there will be 400 rows in this ATC spreadsheet. (The spreadsheet below, which is included in the ATC, uses age categories, so there are fewer rows.) Rather than filling these in by hand, you may prefer to fill in these values in Excel. The spreadsheet will ultimately be saved under the Data file in the ATC directory. You can load data from the spreadsheet directly into the ATC by first saving the spreadsheet in .csv format, as described in the previous page.

Excel will then save your data in .csv format.



To load data from Excel into the ATC, select *Import*. When you do this in the ATC screen titled *Initial Population*, the ATC asks you what to load.



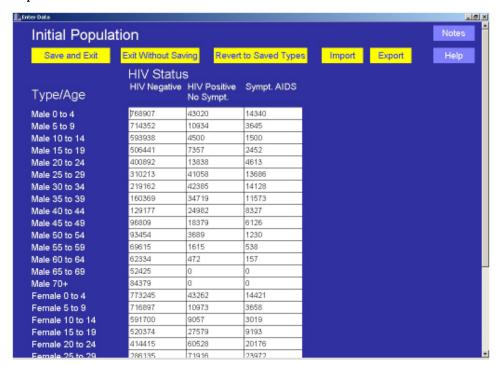
If you already have titled your Excel spreadsheet "Initial\_Population," select Load "Initial Population."

If you have titled it something else, enter the file name and select Load.

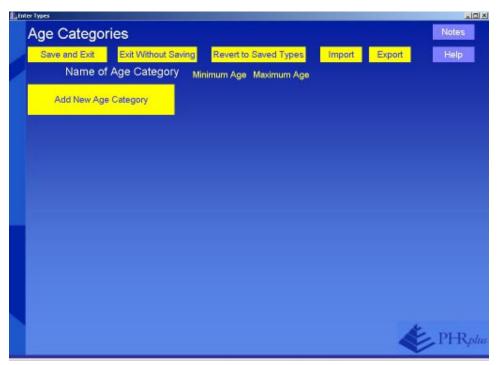
Tie

Be sure that you have saved your Excel spreadsheet in the Data subdirectory before attempting to load it. The ATC assumes that spreadsheets are saved there.

In this example, the data was already saved under the file name *Initial\_Population*. Thus, by selecting *Load "Initial\_Population*," the ATC imports the data:



If you select *Load*, in any *Baseline Data Editor* screens, the ATC will invite you to load an Excel spreadsheet whose file name is the same as the screen title. The most efficient way to load data, therefore, is to save your data in Excel spreadsheets (in .csv format) using the relevant ATC screen titles (with underscores separating words) as file names.



You can select *Import* and *Load "Age Categories"* in the screen above.

Tip

This screen allows you to *Add New Age Category*. Selecting that option causes the ATC to add a row to the spreadsheet. This has been done three times in succession in the example on p.36.

In screens of this type, you can also enter data using the *Import* function. When you first encounter the *Age Categories* screen, it is blank.

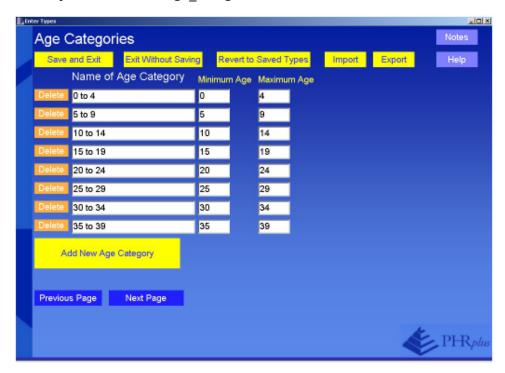
# 3.4. I FIXED AND VARIABLE LENGTH ATC SPREADSHEETS

There are two types of ATC spreadsheets. The spreadsheet entitled *Initial Population* has a fixed number of rows. This number was determined by the *Age Categories* that were entered and the decision to use the National Data option, in this example. (This will be explained in this section below.) The ATC also has spreadsheets that permit you to choose the number of rows. The ATC screen titled *Age Categories* is an example.

Ent	er Types					
	Age Categories					Notes
	Save and Exit Exit Without Savi	ing Revert to	Saved Types	Import	Export	Help
	Name of Age Category	Minimum Age	Maximum Age			
	Delete	0	0			
	Delete	0	0			
	Delete	0	0			
	Add New Age Category					



Once you click on Load "Age\_Categories," the ATC imports data from a saved spreadsheet titled Age Categories.



#### ъ.

The set of age categories that you see here is not complete. The data include too many age categories for the ATC to fit onto a single screen. Selecting Next Page allows you to see the remaining categories. You can use single ages rather than broader age categories in the ATC. To do this, enter no data in the Age Categories screen. The ATC will then assume that your data is not aggregated by age.

# 3.5 EXPORTING DATA

You can also save data from the ATC to an Excel spreadsheet in .csv format. To do this

- 1. In any ATC Baseline Data spreadsheet, select Export,
- 2. Then either select Save As "[Screen Title]," or
- 3. Enter a file name and select Save

In the ATC screen above, if you select *Export*, the ATC prompts you to specify a file name under which to save the data.



When you select *Export* in any ATC screen in the *Baseline Data Editor*, the ATC will invite you to save your data using the screen title as the file name (and insert underscores between words.) It will always save the data to

the *Data* subdirectory as an Excel file in .csv format. If your ATC screen has no data, you can create an empty Excel spreadsheet with the same file name by selecting *Export*.

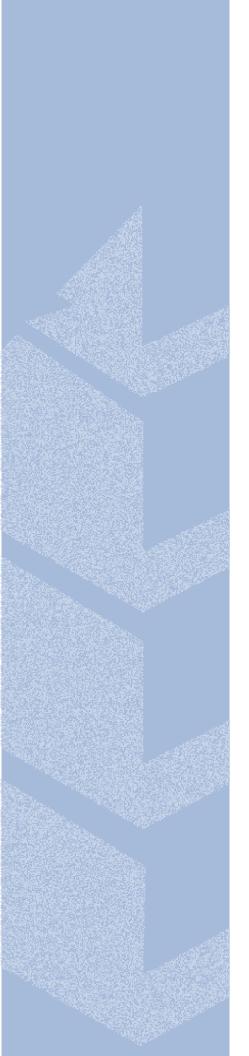
# 3.6 SAVING AND IMPORTING DATA EFFICIENTLY

To use and manage data with the ATC, the following steps are useful.

- 1. For each screen in the ATC's *Baseline Data Editor*, create an Excel spreadsheet in .csv format.
- 2. Save each Excel spreadsheet using as a file name the title of the ATC screen into which the data will be imported—making certain to separate the title words by underscores.
- 3. Enter data into ATC spreadsheets using Import.

TIP

Saving your data in Excel and importing it into the ATC is the most efficient way to manage your data.



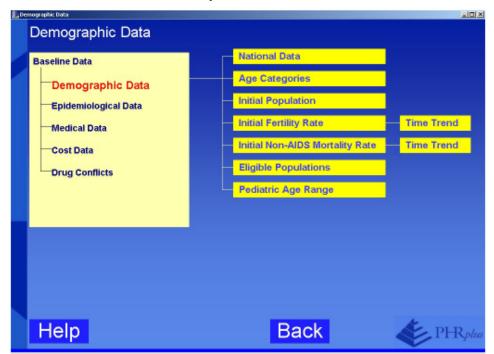
# CHAPTER 4 DEMOGRAPHIC DATA

- 4.1 National Data
- 4.2 Age Categories
- 4.3 Initial Population
  - 4.3.1 Type/Age
  - 4.3.2 HIV Status
  - 4.3.3 Save and Exit/Exit Without Saving
  - 4.3.4 Revert to Saved Values
  - 4.3.5 Help
- 4.4 Initial Fertility Rate
- 4.5 Fertility Time Trend
- 4.6 Initial Non-AIDS Mortality
- 4.7 Non-AIDS Mortality Time Trend
- 4.8 Eligible Populations
- 4.9 Defining an Eligible Population
- 4.10 Pediatric Age Range

# CHAPTER 4 DEMOGRAPHIC DATA

Demographic data are data concerning the size, composition and dynamics of the population in the country that you want to study. The ATC model needs these data for its cost and other projections.

1. Select *Demographics Data* in the *Baseline Data Editor* to enter or edit data for the country of interest.



There are seven sets of *Demographic Assumptions* to enter or edit, as well as two time trends (see categories listed in screen above.) These are explained one-by-one.

#### 4. I NATIONAL DATA

- 1. Select the *National Data* option to indicate whether your data will be broken down by urban/rural status.
  - 2. Enter No if your data is broken down by urban/rural status.
  - 3. Enter Yes if your data is not broken down by urban/rural status.

Tip

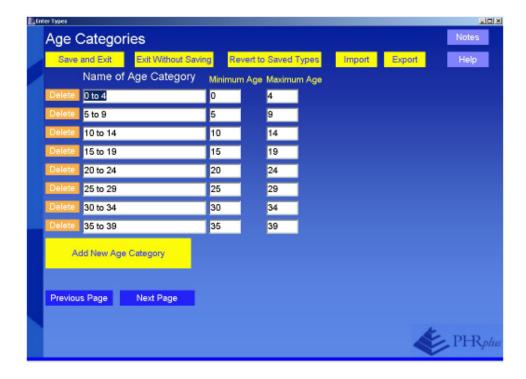
The navigation box at the upper left of the *Demographic Data* screen above, entitled *Baseline Data*, is still present, and the title *Demographic Data* is highlighted. This is the ATC's way of indicating the set of assumptions—that is, the country data—that you can enter or edit using this screen.

To some extent, the ATC allows you to select the structure of the data that you enter. In this case, it allows you to specify whether your data is to be broken down by urban/rural status. In some cases, data regarding the population distribution, or the HIV infection, will be available by urban/rural location. In other cases, you will only have national data. Select *National Data* in the *Demographic Data* screen above to indicate the form of your data. The ATC will generate the screen below. Enter 'Yes' or 'No', according to the question about national data.



# 4.2 AGE CATEGORIES

- 1. Select *Age Categories* to indicate how data are to be categorized by age.
- 2. Age categories must be a non-overlapping, complete set of categories inclusive of ages 0 through 99.

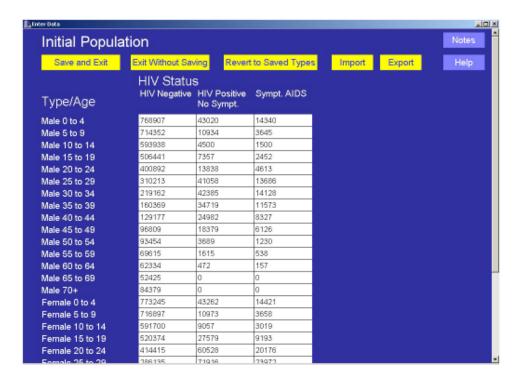


One aspect of your data is the set of age categories that you will use in connection with the ATC. You may enter any set of (non-overlapping) age categories that you like. For example, the *Age Categories* screen (below) enters a set of 15 age categories. To see the seven categories not displayed below, select *Next Page*.

# 4.3 Initial Population

- The Initial Population is the number of individuals in the country that you want to study who fall into each of a set of categories. The categories are defined by age, gender, location—i.e., urban/rural, assuming that you select the National Data option—and HIV status.
- Values for these data should be integers greater than or equal to zero.

The ATC begins with a model of the population in the country that you want to study. For that reason, it requires an estimate of the country's population in the first year of the model's projections. When you select *Initial Population* from the *Demographic Assumptions* screen, the ATC model produces an ATC model spreadsheet. This looks very much like an Excel spreadsheet. Each cell in the spreadsheet is defined by a specific age, gender, location, and HIV status. Data in the cells give the *total population* in country characterized by the relevant age, gender, location, and disease status. In the *Initial Population* screen (below), national data is being used, so the initial population is not categorized by location.



#### Tip

The spreadsheet uses the age categories that were entered earlier.

# 4.3.1 TYPE/AGE

The first column of this spreadsheet is simply a list of labels. These name the rows in the spreadsheet. Each row of data represents a specific demographic group defined by age and gender.

#### 4.3.2 HIV STATUS

The *Initial Population* spreadsheet has three columns of data. Each column represents a particular disease status.

- HIV-,
- HIV+ but asymptomatic, or
- HIV+ with AIDS.

The cells of the spreadsheet thus represent groups defined by age, gender, and disease status. Once again, had you chosen not to use the *National Data* option, the data would be categorized by age, gender, urban/rural status, and HIV status. In this simulated data set, data\_simulation\_1, for example, there are 400,892 males in the population who are between 20 and 24 years of age and are HIV-; in the same age group, 13,838 are HIV+ but asymptomatic; and 4,613 have AIDS.

# 4.3.3 SAVE AND EXIT/EXIT WITHOUT SAVING

1. Save data on Initial Population that you have entered by selecting *Save and Exit*.

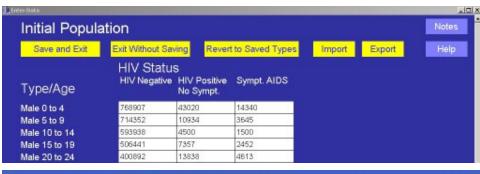
After entering Initial Population data, you can exit this screen and either save or not save the data that you enter, by selecting either *Save and Exit* or *Exit Without Saving*.

Tip

Recall that to save these data permanently, you need to return to the *Baseline Data* screen, type a file name in the space at the upper right of the screen, and select *Save Current Baseline Data*.

#### Tip

Remember that to save data that you have entered or edited, you must also select Save Current Baseline Data in the initial Baseline Data screen from earlier.





#### 4.3.4 REVERT TO SAVED VALUES

1. To undo changes in a saved data set that you have edited, select *Revert to Saved Values*.

Notice the option *Revert to Saved Values* in the Initial Populations screen. You might begin your ATC model session using an already saved data set, loaded from the *Baseline Data* screen. After editing a saved data set, you may decide that you prefer to use the data as it was before editing. In that case, select *Revert to Saved Values* and exit the screen. (Since these values already have been saved, it will not matter whether you exit by *Save and Exit* or by *Exit Without Saving*.)

#### 4.3.5 HELP

As in all ATC model screens, you can access help using the *Initial Population* screen by selecting *Help*.

### 4.4 INITIAL FERTILITY RATE

- The *Initial Fertility Rate* is the number of births per 1,000 population in the country of interest, broken down by age category (and by urban/rural status if you do not select National Data).
- Values for these data should be positive integers. For age groups younger than the minimum age of fertility, enter zero. For age groups above the maximum age of fertility, enter zero.

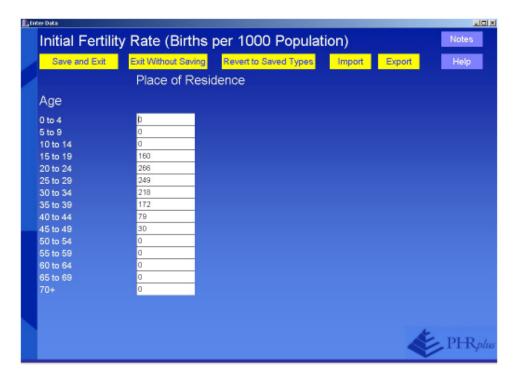
Country populations are dynamic—that is, they change over time. One force affecting the size of a population is fertility, and the ATC includes a fertility rate in its model of populations. The fourth set of *Baseline Data* to specify is initial fertility rates. To enter these data, select *Initial Fertility Rate* from the *Demographic Data* screen.



Selecting Initial Fertility Rate causes an ATC model spreadsheet to appear.

Tif

As the screen title indicates, fertility rates are entered as births per 1,000 population. This means that data entered here should be non-negative integers. These data are entered by age category, to reflect the fact that fertility varies with age. Enter zero for age groups that are either below the minimum age of fertility, or above the maximum age.



Fertility data are entered by age and place of residence. If you select that National Data option, there will be only one column under *Place of Residence*. If you do not select that option, there will be two columns, titled *Urban* and *Rural*. In the example, there is one column only.

As with the screen for *Initial Population*, you can exit this screen and either save or not save the data when you do. After editing saved data, you can revert to saved values. Finally, you can import data from a spreadsheet in the data directory, or save data to a spreadsheet, by selecting *Import* or *Export*.

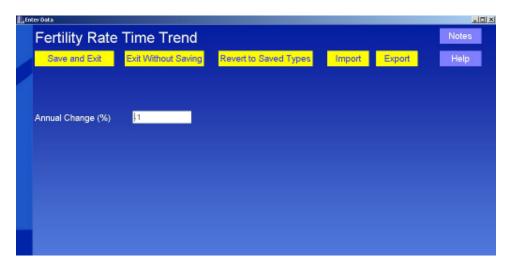
# 4.5 FERTILITY TIME TREND

- The (initial) Fertility Time Trend is the whole percent by which the initial fertility rate increases or decreases from one year to the next.
- Data for time trend are to be entered as either positive or negative whole percentages.
- These data should have values between -100 and 100.

The fertility rate in a given year is the number of births per 1,000 population, by age group, in that year. But fertility rates can change over time, and the ATC model accounts for this by including a Fertility Rate Time Trend in its model of country populations. This is important for the ATC model projections. The ATC model projects the demographic, epidemiological, and costs associated with providing ARV treatment up to five years into the future. Baseline Data record country data for the first year of the estimate. To project

data into the future, the ATC model requires users to enter an estimate of how fertility, and so the population, changes over time.

1. To enter the Fertility Rate Time Trend, select Time Trend in the Demographic Assumptions screen, immediately to the right of Initial Fertility. This will cause the ATC model to produce the following screen.



**EXAMPLE** 

Assume that fertility in year 1 is 180 births per 1,000 population for women in the 20-24 age group, and let the time trend be -1 percent annually, as above. In year 2 of the projection, fertility for the same age group would be  $.99 \times 180 = 178.2$  births per 1,000 population.

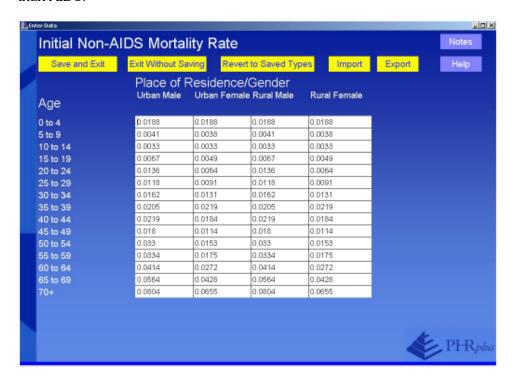
### 4.6 Initial Non-AIDS Mortality

- The Initial Non-AIDS Mortality rate is the fraction of the population who will die from causes other than AIDS during a period of one year. These data are entered, by age, gender, and location.
- Values for these data should lie between zero and one.

Another force affecting the size of a population is mortality; this is another aspect of population dynamics. To model these dynamics, the ATC bases its calculations in part on mortality rates. Two such rates appear in the model; the first is an *Initial Non-AIDS Mortality Rate*. This is the fraction of the population who will die from causes other than AIDS over the course of a single year.

To enter these data, select *Initial Non-AIDS Mortality Rate* from the *Demographic Assumptions* screen. The ATC model will then produce an ATC model spreadsheet.

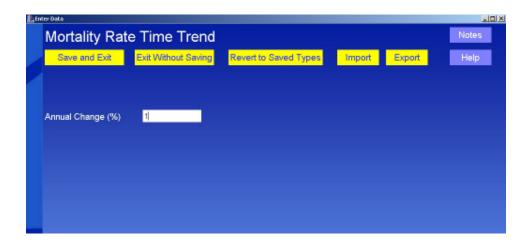
The spreadsheet has one row for each age group and, in the example below, four columns of data. There are four columns in this example to illustrate how the spreadsheet will look if you are not using National Data. For each age, gender, and location, the cells in the spreadsheet give the expected fraction of the population who will die within one year from causes other than AIDS.



# 4.7 Non-AIDS MORTALITY TIME TREND

- The Non-AIDS Mortality Time Trend is the percentage by which non-AIDS mortality changes from year to year.
- Time trend data are entered in the ATC model as whole percentages.
- Values for these data should lie between zero and one hundred.

As with initial fertility, there is a time trend associated with Non-AIDS Mortality. The ATC model requires you to specify how non-AIDS mortality changes over time. To do this, select the second occurrence of *Time Trend* in the screen for *Demographic Data*. The ATC model will then produce a screen like the one in which you entered the time trend for initial fertility.



#### EXAMPLE

In the screen above, initial non-AIDS mortality for urban males between the ages of 20 and 24 is .0136 in year 1. Assuming a time trend of 1 percent annually (eee below), non-AIDS mortality in year 2 will be  $0.0136 \times 1.01 = 0.01496$ .

# 4.8 ELIGIBLE POPULATIONS

- Eligible Populations are demographic groups toward which policymakers might wish to direct an ARV treatment program.
- These are groups defined in the *Baseline Data* for later use in specifying an ARV treatment Scenario.
- To define an eligible population, specify the ranges of ages to be included, whether both males and females are included, and whether the population in question is to receive only treatment for mother to child transmission (MTCT.) If you are not using the National Data option, also indicate whether an eligible population includes urban or rural residents, or both.

Defining a group as Eligible in the Baseline Data *does not* mean that you must regard this group as receiving ARV screening and treatment when you define scenarios later; it merely makes this possible.

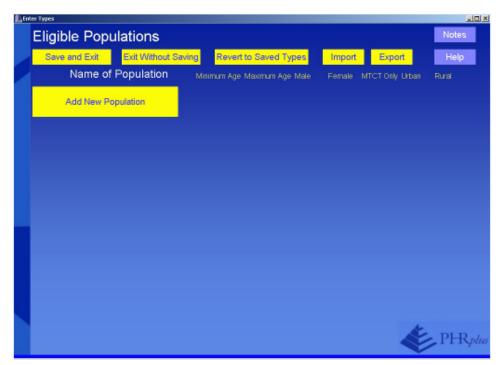
Tip

Defining a group as an Eligible Population as part of Baseline Data merely ensures that you will be able to refer to that group later as you specify a policy scenario. For example, for each group that you define as an Eligible Population, the ATC model later will allow you to define ARV treatment scenarios in which that group receives (or does not receive) ARV screening and treatment.

Tip

Unlike age categories, eligible populations need not be mutually exclusive nor collectively exhaustive.

When you select *Eligible Populations* from the *Baseline Data* screen, the ATC model generates an interface for defining demographic groups. Eligible groups are defined by the ages and genders that they include and whether they are MTCT only groups.



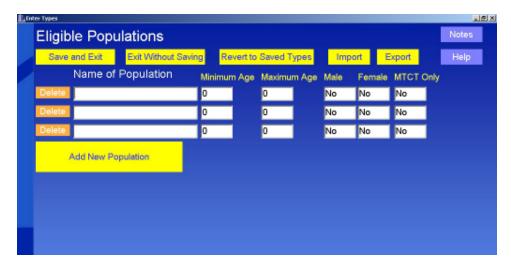
- Minimum and Maximum Age: Specify minimum and maximum ages to restrict the group that you define to individuals whose ages fall in a particular range. The Minimum Age is the lowest age of individuals to be included in the eligible population that you are defining; the Maximum Age is the highest.
- **Urban:** (Assumes that you are not using National Data.) Enter 'Yes' if the group includes all individuals living in urban areas (who satisfy the other conditions that you define); enter 'No' otherwise.
- Rural: Enter 'Yes' if the group includes individuals living in rural areas (who satisfy the other conditions that you define) and 'No' otherwise.
- **Male:** Enter 'Yes' if the group includes all males (who satisfy the other conditions that you define), and 'No' if it does not.
- **Female:** Enter 'Yes' if the group includes all females (who satisfy the other conditions that you define), and 'No' if it does not.
- MTCT Only: Enter 'Yes' if the group in question is to receive MTCT treatment only—that is, if the group is to receive treatment for MTCT but not for AIDS or for opportunistic infections. Enter 'No' otherwise.

Tie

If you enter 'Yes' for MTCT Only enter 'No' in the columns for Male and Female and enter only ages over which females are fertile. In the ATC model, MTCT treatment is assumed to be available only to pregnant females who are HIV+. The population of women receiving MTCT treatment thus does not include males. It also does not include females who are HIV-or either too young or too elderly to be fertile.

# 4.9 DEFINING AN ELIGIBLE POPULATION

1. To define a new eligible population, select *Add New Population*. If you were to do this in the blank Eligible Populations screen above, this would cause rows with blank cells to appear. (*Add New Population* was selected three times in succession below.) You may enter data into these rows.



After entering data, you will have a screen that looks like the following.



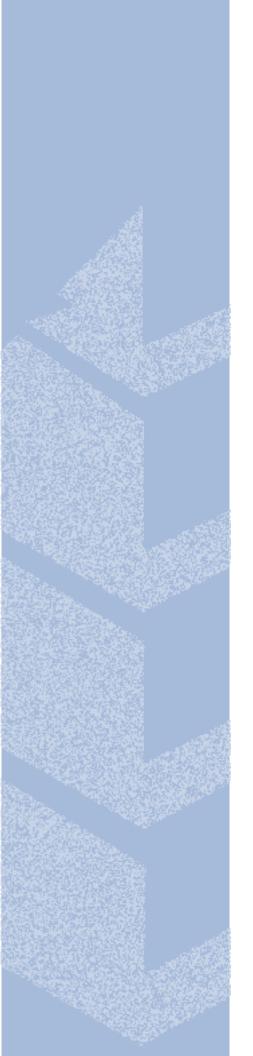
2. To delete an eligible population, select the corresponding *Delete* option (at left of the population name). As with other ATC model spreadsheets, you can exit with or without saving your data.

# 4. I O PEDIATRIC AGE RANGE

1. To indicate the range of ages to which only pediatric ARV drugs and other therapies should be given, enter minimum and maximum ages in the screen titled *Pediatric Age Range* in *Demographic Data*.



When you use the Scenario Editor to define an ARV treatment program, you will be asked to specify which drugs are pediatric, and therefore can be given to children, and which are not. In some cases, these will be specific drugs that are meant for children. In other cases, these will simply be pediatric doses of drugs that may also be given to adults. This function requires you to specify what ages are to count as eligible for pediatric drugs. You indicate this age range by indicating minimum and maximum ages in the screen above.



# CHAPTER 5 EPIDEMIOLOGICAL DATA

- 5.1 HIV Infection Rate
- 5.2 AIDS Symptoms Development Rate
- 5.3 Mother to Child Transmission Rate
- 5.4 Opportunistic Infections
- 5.5 Additional AIDS Mortality Rate

# CHAPTER 5 EPIDEMIOLOGICAL DATA

After specifying *Demographic Data*, select *Back* to return to the *Baseline Data* screen and select *Epidemiological Data*. The ATC model will generate a new list of data to specify. These describe the epidemiology of HIV in the country that you consider.



# 5.1 HIV INFECTION RATE

- The HIV Infection Rate is the likelihood that an uninfected individual of a given age, gender, and location (urban/rural) will contract HIV during a one-year period. In other words, this is the percent of individuals of a given age, gender, and location expected to contract HIV in a single year.
- Enter these data as fractions in decimal form.
- Values for these data should lie between zero and 1.

The ATC model includes not merely a representation of populations and their dynamics but also of the epidemiology of HIV. This epidemiology, too, is dynamic; the size of the population infected with HIV may change over time. In order to represent this fact, the ATC model requires you to indicate the rate at which individuals in the country become infected with HIV in a single year. Selecting HIV Infection Rate from the Epidemiological Data screen returns an ATC model spreadsheet.

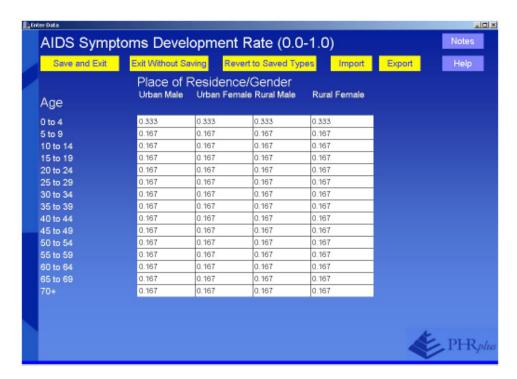


This spreadsheet has one row for each age category that you use. It has columns defined by gender and, possibly, urban/rural location.

# 5.2 AIDS SYMPTOMS DEVELOPMENT RATE

- The AIDS Symptom Development Rate is the percentage of those who are HIV+ but asymptomatic who will develop AIDS during a one-year period.
- Enter these data as fractions in decimal form.
- Values for these data should lie between zero and 1.

Over time, some individuals who are HIV+ will develop AIDS. This, too, is part of the dynamic epidemiology of the disease. The ATC requires you to enter data that estimate the rate at which this happens. This is the *AIDS Symptom Development Rate*. In the ATC, this is the percent of HIV+ individuals who will develop AIDS over the course of one year. Enter these data in a spreadsheet like the one below.



# 5.3 MOTHER TO CHILD TRANSMISSION RATE

- The Mother to Child Transmission Rate is the probability that a pregnant, HIV+ woman will transmit HIV to her child, assuming that she were to receive no treatment to prevent transmission.
- Enter data in the MTCT screen.
- Values for the MTCT rate should lie between zero and one.

HIV+ women who bear children can transmit HIV to their newborn children. This can happen either in utero, during labor, or during breastfeeding. For any given population, one can estimate the probability of MTCT. This is relevant to using the ATC because the ATC models new infections, and MTCT is one route by which new infections occur. For this reason, the ATC requires you to enter data on the MTCT rate.

Note that this is the rate of transmission *only for cases where a woman receives no treatment to prevent MTCT.* Later, when you define an ARV treatment scenario, the ATC will ask you separately to specify the rate of transmission from mothers to newborns by women who receive treatment to prevent such transmission.



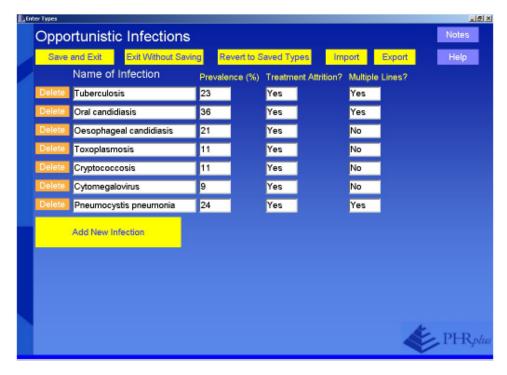
# 5.4 OPPORTUNISTIC INFECTIONS

 Opportunistic Infections (OIs) are infections contracted by individuals with AIDS. The ATC allows you to indicate which such infections an ARV treatment program will include.

In the screen titled *Opportunistic Infections*, enter:

- 1. Name of infection
- 2. *Prevalence of the infection*. This is the percent of the population with AIDS who have that specific OI. Enter these data in whole percents. Data should lie between one and 100.
- 3. Enter 'Yes' if there is *treatment attrition*—that is, if treatment for the infection will become ineffective over time.
- 4. Enter 'Yes' if there are second or thirds lines of treatment, to be used in cases where a first line of treatment has become ineffective.

Patients with AIDS may contract what have come to be called Opportunistic Infections. The ATC allows you to consider ARV treatment scenarios under which patients will be treated for some of these infections. When you define an ARV treatment scenario, the ATC will allow you to select OIs to be treated in that scenario. But you will be able to select an OI to treat as part of a scenario only if you listed that infection as part of your Epidemiological Data. To list OIs that an ARV treatment program may treat, select Opportunistic Infections after selecting Epidemiological Data. This will cause the ATC to generate a screen like the one below (where data has already been entered.)



In the example above, there are seven OIs.

For each infection, the input data includes:

- The prevalence of the infection among the population with AIDS.
   This is the percent of the population with AIDS who also have a certain OI. In the screen above, for example, it is assumed that 23 percent of the population with AIDS have tuberculosis.
- Whether there is treatment attrition. Treatment attrition occurs when a line of treatment becomes ineffective for some patients. In the screen above, attrition occurs in some AIDS patients who are treated for tuberculosis.
- Whether there are multiple lines of treatment. Above, you can see that, when a first line of treatment for tuberculosis fails, there are second, and perhaps other, lines of treatment.

# 5.5 ADDITIONAL AIDS MORTALITY RATE

- The Additional AIDS Mortality Rate is the probability that a patient with AIDS will die from AIDS within one year.
- Enter these data as fractions in decimal form.
- Values for these data should lie between zero and 1.

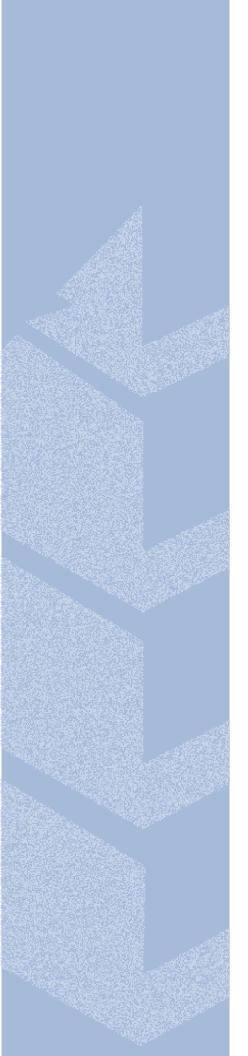
People with AIDS typically have much higher mortality rates than the general population. They are at risk of dying from the same causes as someone who is HIV-. In addition to this background risk of mortality, people with AIDS are also at risk of dying from illness associated with AIDS. This



spreadsheet specifies the *additional* mortality risk faced by patients with AIDS over a 1-year period by age, gender, and location. Note that this AIDS mortality is calculated separately from general mortality, in an attempt to model the chance of dying of non-AIDS causes as well as from AIDS.

#### **EXAMPLE**

Assume that the Non-AIDS Mortality Rate for 30-year-old males is 3 percent (0.03). This is their risk of dying from causes other than AIDS. Assume that their Additional AIDS Mortality is 50 percent (0.5). In that case, a 30-year old male with AIDS will have a 50 percent chance of dying from AIDS within one year (this rate is applied first). Assuming that he does not die from AIDS, he will then have a 3 percent chance of dying of other causes. Thus, a total of 48.5 percent of the 30-year-old male population with AIDS will survive to the next year, because 50 percent will die of AIDS and 3 percent of the remaining 50 percent (1.5 percent) will die of other causes.



# CHAPTER 6 MEDICAL DATA

- 6.1 Health Facility Types
- 6.2 Staff Types
- 6.3 HIV Screening Tests
- 6.4 Confirmation Tests
- 6.5 ARV Drug Types
- 6.6 ARV Drug Protocols
- 6.7 ARV Drugs
- 6.8 AIDS Tests
- 6.9 AIDS Test Facilities—i.e. AIDS Test Availability, by Facility
- 6.10 Opportunistic Infection Protocols
- 6.11 Pregnancy Tests
- 6.12 MTCT Regimens

### CHAPTER 6 MEDICAL DATA

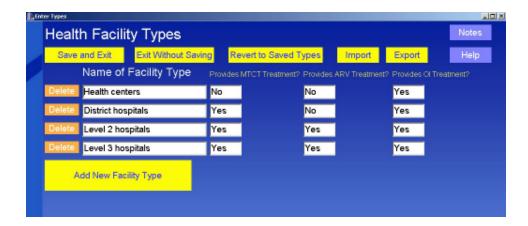
Demographic and Epidemiological Data describe the population of a country and the epidemiology of HIV/AIDS within it. Medical Data describe the healthcare infrastructure of a country. This defines, in part, the universe of possible ARV treatment programs and enables the ATC to estimate the costs associated with any such program. After completing the demographic and epidemiological data, select Medical Data from the Baseline Data screen. The ATC will then generate the screen below.



As with the screens for *Demographic* and *Epidemiological Data*, there are several sets of *Medical Data* to specify, represented by the bars arrayed at the right in this screen. Select each of these, one by one, to enter data.

### 6. I HEALTH FACILITY TYPES

- 1. In the first column of the screen below, list all *types of health care facilities* where patients might receive services.
- 2. For each type of facility that you list, enter 'Yes' in the second column, if facilities of that type provide treatment to prevent MTCT, and 'No' otherwise.
- 3. For each type of facility that you list, enter 'Yes' in the third column, if facilities of that type provide ARV therapy, and 'No' otherwise.
- 4. For each type of facility that you list, enter 'Yes' in the fourth column, if facilities of that type provide treatment for OIs, and 'No' otherwise.



The health care infrastructure of a country that is relevant to providing ARV treatment consists, first, of the types of facilities within a country. Any country might have more than one kind of facility available to participate in an ARV treatment program. Not all facilities need to provide all types of ARV treatment. The ATC assumes that all facilities will offer HIV screening services (screening, confirmation, and counseling). But it does not assume that all types of facilities provide treatment to prevent MTCT of HIV, ARV therapy, or treatment for OIs.

The ATC requires you to indicate the types of facilities potentially available to an ARV treatment program and to indicate what types of treatment are available at these facilities. In the screen above, for example, there are four types of facilities. All of them are assumed to provide treatment for OIs, but not all provide ARV treatment or treatment for MTCT.

The ATC uses data on facility types in two ways. When you define scenarios using the Scenario Editor, you will be asked how patients are distributed across the health facilities within a country. This distribution is important for three reasons.

 Staff wages may vary by type of facility—you will see this shortly in the section on Cost Data. If a larger percent of the patient

- population receives care at facilities where wages are high, this will increase the cost of an ARV treatment program.
- Capital costs vary by type of facility. If a larger percent of the population receives care at more expensive facilities, this, too, will raise the cost of a treatment program.
- Not all services need be available at all types of facilities. Each population is distributed across facilities which provide each type of treatment. This assumes that if someone is diagnosed with AIDS in a rural facility not capable of treating AIDS, she will be directed to a more advanced hospital for treatment. The only treatment option that might not be provided is a specific AIDS test. Someone who is treated for ARVs at a rural hospital that cannot provide viral load tests does not receive viral load tests; she gets only tests that are offered at that facility.

#### 6.2 STAFF TYPES

- Staff Types refers to categories of health staff that might participate in an ARV treatment program.
- 1. Enter these by selecting *Staff Types* from the *Medical Data* screen.



In the screen above, for example, there are ten types of staff that might be involved in an ARV treatment program. Only seven appear on the screen above. To see the remaining types, select the *Next Page* option.

The ATC uses *Staff Types* several ways. First, when you define a treatment scenario, for each treatment you will indicate how much time physicians, nurses, and other types of staff spend per person. For example, a scenario might assume that screening requires 15 minutes of physician time per patient, ten minutes of nurse time per patient, and 20 minutes of lab

Tip

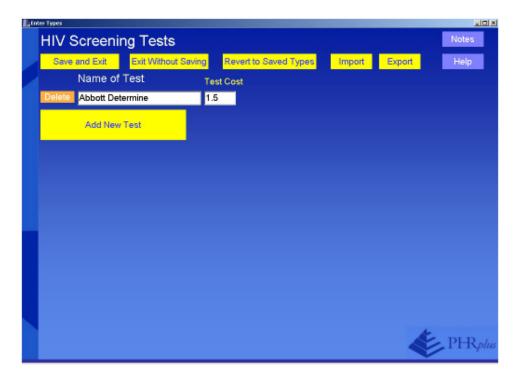
The Next Page option in the screen above allows you to list more Staff Types than will fit on a single screen, by continuing your list on a next page. If you enter a list of staff types in an Excel spreadsheet, and the list is too long to fit on a single ATC screen, the ATC will automatically make additional pages when you import the spreadsheet. View these after importing by selecting Next Page and Previous Page.

technician time per patient. As shown in the section on *Cost Data*, wages will vary by staff type. Scenarios will be more expensive if they use more time of staff whose wages are high.

Second, scenarios that use more time by staff of a given type require more staff of that type. Assumptions regarding use of different types of labor thus imply different resource requirements. Finally, the ATC's cost calculations include the costs associated with training staff. If a scenario requires many staff of a given type, it will imply higher training costs as well.

### 6.3 HIV SCREENING TESTS

- HIV Screening Tests are tests given to detect the presence of HIV in an individual. Enter these by selecting HIV Screening Tests from the Medical Data screen.
- Values for these data are (i) the name of the test, and (ii) the per person cost of the test.



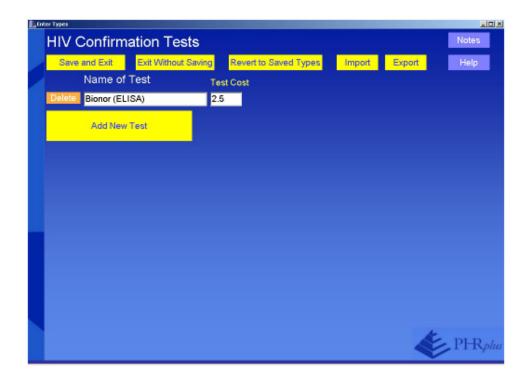
The ATC assumes that any ARV treatment program will screen at least some part of the patient population for HIV. When you define a treatment scenario, the ATC therefore requires you to specify at least one screening test. It is possible that, in certain countries, more than one HIV screening test is available and that costs vary. However, in this data set, data\_simulation\_1, it is assumed that only one test is available, at a cost of 1.5 per person per test.

The ATC uses the cost of HIV screening tests in order to compute the total and per person cost associated with screening for HIV, and the overall costs of an ARV treatment program.

### 6.4 CONFIRMATION TESTS

The ATC assumes that, if someone tests positive in a screening test for HIV, they may be given one or more *Confirmation Tests*.

1. Enter the name of the test and per person cost of testing in the screen below.



Tip

Unlike screening tests, the ATC does not assume that everyone who tests positive for HIV will receive a confirmation test. You will be able to define scenarios that assume no confirmation testing.

The ATC assumes that individuals who test positive for HIV in an initial screening test may receive zero, one, or more than one confirmation test. List each type of confirmation test that an ARV treatment program might use in the screen above, adding lines as necessary, and indicate the per person cost of each confirmation test.

Confirmation tests represent a type of variable cost in the ATC. More extensive use of confirmation tests will increase the cost of an ARV treatment program, as will use of tests that have a higher per person cost.

### 6.5 ARV DRUG TYPES

- 1. Specify drug types by selecting *ARV Drug Types* in the *Medical Data* screen.
- 2. Enter data by typing names of drug types into spaces on the screen.



The ATC allows you to specify scenarios in which some populations are eligible to receive ARV therapy. As part of *Medical Data*, the ATC requires you to specify treatment *protocols* that will be available in an ARV treatment program. Protocols are defined by:

- The types of ARV drugs that they require, and
- The combination in which the protocols use the drugs.

To define a protocol, the ATC requires you to indicate what types of ARV drugs will be available in the country that you consider. Only types that you list in this screen will be available later, when you begin to define protocols (as you will do in the next screen). In the example above, it is assumed that three types of drugs will be available—Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTI), Nucleoside Reverse Transcriptase Inhibitors (PI.)

### 6.6 ARV DRUG PROTOCOLS

- ARV Drug Protocols are combinations of types of ARV drugs.
- 1. Enter these by typing names of combinations in the column titled *Name of Protocol* in the ARV Protocols screen.
- 2. Indicate the number of each type of drug used in the protocol.



For the purposes of the ATC, an ARV treatment *protocol* consists of drugs used in combination. ARV drugs are categorized by *type*, and the ATC treats a protocol as a combination of types of ARV drugs. In the example above, only three ARV treatment protocols, each of which consists of a combination of one or more types of drugs entered in the previous *ARV Drug Type* screen. The first protocol, for example, consists of two NRTI drugs and one NNRTI, while the second consists of three NRTI drugs.

#### Tip

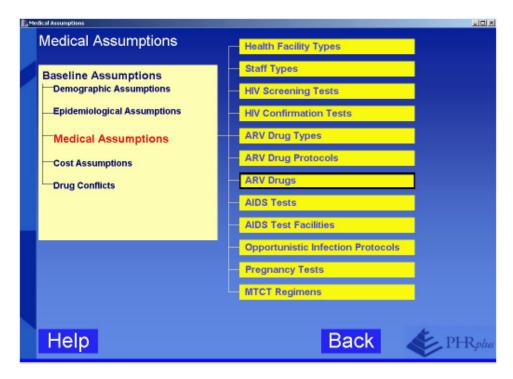
The columns in the ARV Protocols screen are determined by the data that you enter in the Drug Types screen just preceding. Note also that the name of a protocol is merely a name. The names used above make the composition of the protocols transparent but they play no other role in the ATC.

#### 6.7 ARV DRUGS

- ARV Drugs are specific drugs used to treat patients with AIDS.
- 1. Specify these by selecting *ARV Drugs* in the *Medical Data* screen, and then selecting a *type* of drug from the subsequent screen.
- 2. On each line enter:
  - a. The name of the drug;
  - b. Its associated annual per person cost, and
  - c. Whether the drug may be given to children.

Tip

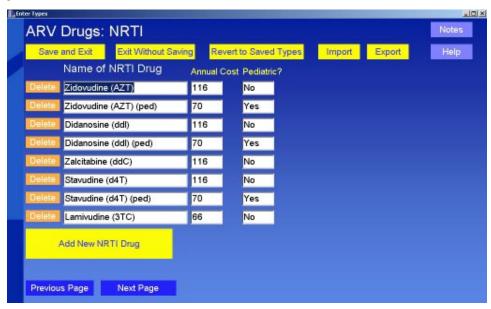
The per person cost of an ARV drug includes only the cost associated with the drug itself. Other costs associated with ARV therapy are handled elsewhere in the ATC.



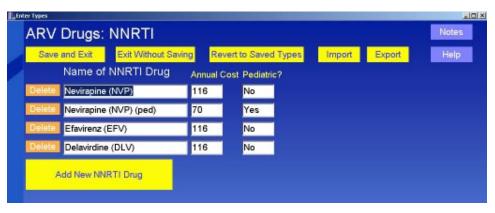
Selecting ARV Drugs will cause the ATC model to produce a new screen allowing you to select the *type* of drug that you want to enter. The options that appear under Select ARV Drug Type are determined by the ARV drug types that you entered in the earlier screen titled ARV Drug Type. If you do not see an ARV drug type that you want to consider in designing an ATC scenario, return to the earlier screen and enter the missing type.

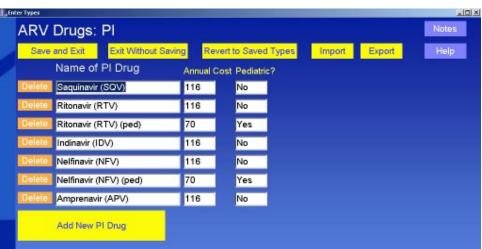


If you wish to enter NRTI drugs, for example, make the appropriate selection; this will cause the ATC to produce still another screen, where you enter specific NRTI drugs, their annual per person cost, and whether they are pediatric.



After entering drugs of a given type—in this case, NRTI drugs—select *Save and Exit* to return to the previous screen. Then, enter drugs of other types as seen below.

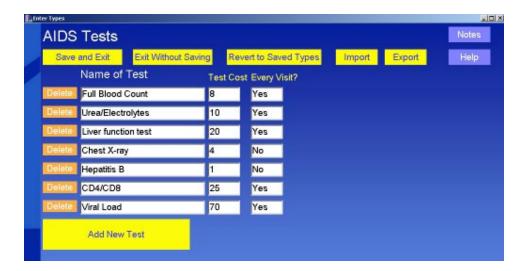




### 6.8 AIDS TESTS

- AIDS Tests are tests administered to people with AIDS and receiving ARV treatment.
- 1. Enter the name of the test and the cost of a single administration of the test.
- 2. Enter 'Yes' if the test is to be administered at every visit, and "No" otherwise.

While receiving ARV therapy, patients may receive a range of periodic tests. Selecting AIDS Tests from the Medical Data screen allows users to list tests given to people with AIDS, the cost per visit of the tests, and whether AIDS patients receive the test on every visit to a healthcare provider. (In the Scenario Editor, you will indicate whether patients receive that test on every visit for each test that your scenario provides.)



### 6.9 AIDS TEST FACILITIES—I.E. AIDS TEST AVAILABILITY, BY FACILITY

- 1. Select AIDS Test Facilities in the Medical Data screen.
- 2. In the screen titled AIDS Test Availability (by Facility), indicate what tests are available at each type of facility.
- 3. Enter 'Yes' if a specified test is available, and "No" otherwise.

In the screen titled *Health Facility Types*, you indicate the types of facility that might participate in treating AIDS. In the *AIDS Tests* screen, you indicate which tests patients with AIDS might receive as part of an HIV/AIDS treatment program.

In the earlier example based on the data set, data\_simulation\_1, four types of health facilities were identified to participate in treating HIV/AIDS. These were:

- Health centers
- District hospitals
- Level 2 hospitals
- Level 3 hospitals

A list of tests that patients with AIDS might receive periodically over the course of their treatment was also specified. But not all tests need be available at every facility. The screen titled AIDS Test Availability (by Facility) allows users to indicate which tests are available at which types of facilities. This will help determine, for example, how many of each type of facility an ARV treatment program requires.



### 6. I O OPPORTUNISTIC INFECTION PROTOCOLS

- 1. To specify protocols for treating OIs, select *Opportunistic Infection Protocols* from the *Medical Data* screen.
- 2. Select an OI from the screen titled Select Protocols For.
- 3. In the screens for each OI, enter the name of the available protocols; this refers to a combination of tests and costs.
- 4. Enter the annual cost of tests associated with each protocol.
- 5. Enter the annual cost associated with drugs used to treat the OI.

An ARV treatment program may include treatment for OIs associated with AIDS. The *Medical Data* screen requires you to specify protocols for treating OIs. The OI protocols that you specify will be options available later when using the Scenario Editor to define a specific treatment program. Note that the protocols for treating OIs include both the cost of testing and the cost of drug therapy.

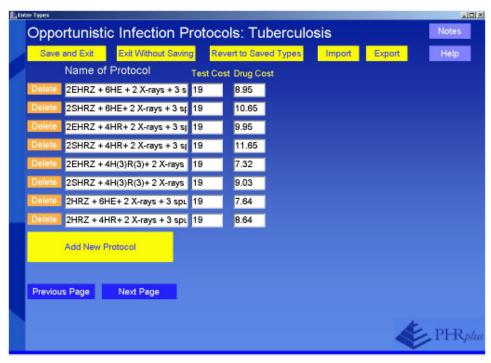
To specify protocols for treating OIs, begin with the *Medical Data* screen and select *Opportunistic Infection Protocols*, as shown below.



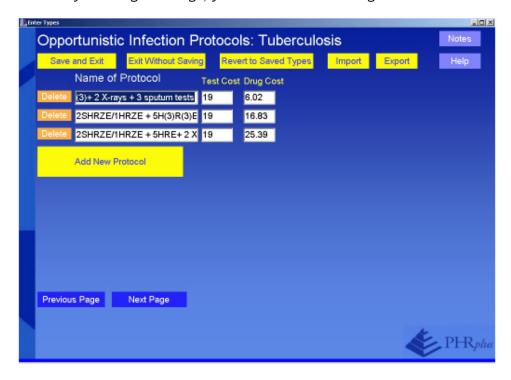
The ATC will then allow you to identify the OIs for which you can enter protocols.



Protocols for treating tuberculosis are specified here. This causes the ATC to produce a new screen, where you can indicate possible protocols by name, and indicate the annual costs of testing and treatment associated with the protocol.



This is a case where not all available tests will fit onto a single ATC screen. By selecting *Next Page*, you can see the remaining tests.



Once you have entered protocols for the first OI that you listed, return to the screen titled *Select Protocols For*, and choose the next OI.

### 6. I I PREGNANCY TESTS

- Pregnancy Tests are administered to the MTCT population to identify women who are HIV+ and pregnant.
- 1. Enter data for the range of ages over which pregnancy tests are to be administered; these ages will correspond to the ages during which a woman in the population is fertile.
- 2. Also enter the cost of administering a single test.

An ARV treatment program might include treatment to prevent MTCT of HIV. Treatment to prevent MTCT would be given to a woman only if she is HIV+ and pregnant. A program that proposes to treat MTCT, therefore, needs to include pregnancy testing.

The ATC model requires you to specify the range of ages over which women should be tested for pregnancy, and the cost of administering a single test. To specify the range of ages for testing, and the cost per test, select *Pregnancy Tests* from the *Medical Data* screen. Enter data in the screen titled *Pregnancy Tests* (MTCT Only).



### 6. I 2 MTCT REGIMENS

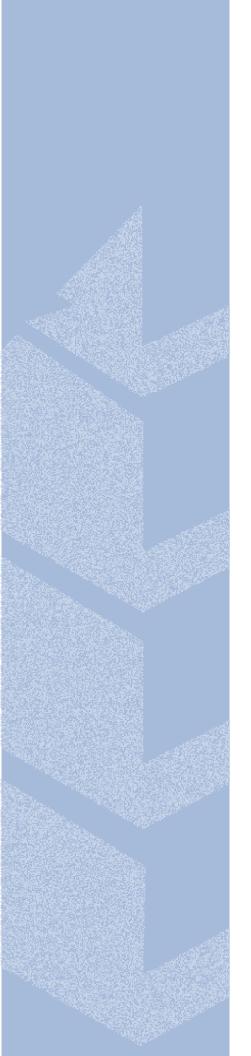
- MTCT Regimens are possible drug protocols for use in preventing MTCT of HIV.
- 1. Enter the name of each regimen.
- 2. Enter the total cost of the regimen.

The final *Medical Data* to specify is the set of possible regimens for treatment to prevent MTCT of HIV. To specify possible MTCT regimens, select *MTCT Regimen* from the *Medical Data* screen. In the example screen on the next page, four possible regimens are specified.



Tip

The cost of an MTCT regimen is the cost of treating a single pregnancy to prevent MTCT.



## CHAPTER 7 COST DATA

- 7.1 Staff Hourly Compensation
- 7.2 Training Requirements
- 7.3 Capital Item Costs
- 7.4 Annual Interest Rate
- 7.5 Capital Item Requirements

### CHAPTER 7 COST DATA

After entering *Medical Data*, return to the *Baseline Data* screen. *Cost Data* are the next set of data that you need to specify. Selecting *Cost Data* from the *Baseline Data* screen introduces a new set of options.

These treat costs associated with labor and capital items needed in order to staff and equip an ARV treatment program. In the screen below, you can see the different categories of data to be entered in the *Cost Data* section.



### 7. I STAFF HOURLY COMPENSATION

- Staff Hourly Compensation is total hourly compensation paid to staff of each type required by an ARV program. This includes:
  - Wages, and
  - Non-wage compensation of any type.
- 1. You need to specify hourly compensation for each type of staff that you entered in the *Staff Types* screen as part of the *Medical Assumptions*.
- 2. Hourly compensation may vary by type of staff and facility type.
- 3. Enter these data in currency per hour.

Recall that, when specifying *Medical Data*, you listed types of staff—the screen title was *Staff Types*. These are categories of labor possibly employed by an ARV treatment program. Staff of each type receive compensation, and the ATC requires that you specify this. In the course of specifying *Medical Data*, you also listed the types of facilities that might participate in an ARV treatment program. The ATC assumes that, for a single staff type, compensation may vary across facility types. For that reason, it requires you to specify staff compensation by type of staff *and* type of facility.

The ATC uses these data in its cost calculations. When you specify a scenario in the ATC, you will distribute patients across types of facilities. Hourly compensation can vary by type of facility. In order to calculate labor costs, as well as total costs, the ATC needs to know hourly compensation by facility.



In the example above, there are nine types of staff that might be required by an ARV treatment program. These staff are assumed to be available in all types of facilities. Finally, the compensation does not vary by facility type; this aspect of the data is just an illustration and is not required by the ATC.

### 7.2 TRAINING REQUIREMENTS

Data regarding *Training Requirements* help the ATC calculate the costs associated with training a workforce to provide ARV therapy, and to estimate the total number of staff required. Data for these calculations include:

- Annual hours worked, by staff type: This is the estimated average number of hours that staff of each type work in one year. Enter these data as integers between zero and 8760 (the number of hours in one year). Typically, of course, annual hours worked will not exceed 3000 and generally will be lower.
- Turnover rate, by staff type: The turnover rate is the percent of staff
  of a given type who will leave the health care labor force in a given
  year.
- Days of training required: This is the total number of days that staff of each type must train to work in an ARV treatment program. This does not include, for example, the time required for someone to be educated to be a physician. Rather, it is the time required to educate a physician (or staff of another type) to work in an ARV treatment program. The ATC also assumes that staff of each type need to be trained only once; they are not retrained each year.
- **Daily cost of training:** For each type of staff, this is the cost of training staff of the type *net of their typical daily compensation*.

In the screen below, for example, it is assumed that:

- Physicians work 1500 hours per year, on average;
- Fifteen percent of physicians leave the health care workforce each year;
- Five days are required to train physicians to provide treatment for HIV/ AIDS; and
- Training costs 100 in local currency per day.



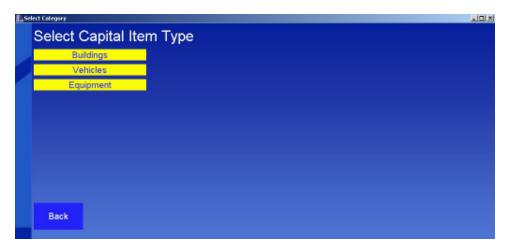
### 7.3 CAPITAL ITEM COSTS

Capital Item Costs are the costs associated with buildings, durable equipment and vehicles.

- For each type of building space potentially required by an ARV program (e.g., hospitals, health centers, laboratories, pharmacies) specify:
  - a. The (current) cost of construction per square unit (feet, meters). This is the cost of construction for buildings of a given type, if they were to be built today.
  - b. The average number of square units (feet, meters) in buildings of the relevant type.
  - c. The years over which building costs are to be amortized (i.e., the number of years over which the costs of the capital should be divided depending on the life span of the capital).
- For equipment and vehicles, users specify only the total purchase cost (if purchased today) and the number of years over which this cost is to be amortized.

In addition to labor, an ARV treatment program requires what economists refer to as capital. Generally speaking, capital includes items that are used over a relatively long period of time. For the case of an ARV treatment program, capital includes buildings (e.g., health centers, hospitals, laboratories,) vehicles, and durable medical equipment. Durable medical equipment might include X-ray machines which are used repeatedly over several years.

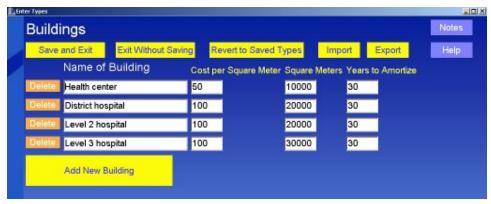
To specify capital cost items, select *Capital Item Costs* from the *Cost Data* screen. This will produce a screen that gives you three options from which to choose, including buildings, vehicles, and equipment.



Selecting *Buildings* from the screen above, permits you to specify the types of buildings that might be required by an ARV treatment program. These should include, at least, all types of health facilities that you specified earlier. They might include other types of buildings as well.

Specifying a building type in this screen does not commit you to include the use of that type of building when you define a particular ARV treatment program in the Scenario Editor. When you specify *Capital Item Requirements*—in a screen encountered shortly—you may stipulate that the ARV treatment program make no use of one or more types of buildings.

In the screen below, some examples of types of buildings are listed using the data set, data\_simulation\_1. For each type of building, the average size of each building in square units, the cost of construction in square meters, and the years over which this cost will be amortized are specified. In all cases, the same period of amortization is assumed. This assumption is based solely on this particular example; in principle, periods of amortization could be different for different types of buildings.



### 7.4 ANNUAL INTEREST RATE

- The Annual Interest Rate is the interest rate that the ATC uses in conjunction with initial capital costs and years of amortization to compute the annual capital cost of a given capital item.
- 1. Enter the interest rate as a fraction in decimal form. (For example, if the interest rate is 5 percent, enter the number 0.05.)
- 2. Values for this interest rate should be greater than or equal to zero. In general, they will lie between zero and one.

The costs associated with capital are not exhausted by the purchase price of a building, for example. Capital typically is purchased using borrowed money, and this means that the total cost of capital includes interest on the loan. In order to calculate annual capital costs, the ATC thus needs to use an interest rate in conjunction with the initial capital cost of an item and the years over which the cost of the item is to be amortized. Select *Interest Rate* from the *Cost Data* screen to enter or edit this interest rate.



### 7.5 CAPITAL ITEM REQUIREMENTS

- 1. For Capital Item Requirements, specify:
  - a. For each capital item, how many will be used for an ARV treatment program. Enter these as integer values.
  - b. For each capital item, what percent of each item will be used by the ARV treatment program. Values for these data should be entered as whole percents; they will lie between zero and one hundred.

An ARV treatment program will use some number of each type of capital item—a certain number of buildings, vehicles, and durable equipment. But capital items have multiple uses, only one of which is use in an ARV treatment program. Hospitals and health centers will treat other diseases aside from HIV/AIDS in most cases; X-ray machines will be used to diagnose diseases other than OIs.

It is useful to think of buildings, vehicles, and durable equipment as kinds of *capacity* available to an ARV treatment program, but possible to use for other purposes as well. In effect, the ATC asks you to specify how much capacity is available for possible use in an ARV program and what percent of this capacity will be used by an ARV program. For each type of building, you need to indicate:

- How many such buildings will be required for use in an ARV program, and
- What percentage of each building will be devoted exclusively to use in an ARV program.

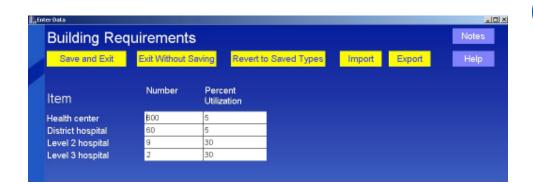
To deliver ARV treatment, a program might require several hospitals, for example, located in different regions of a country. But it is unlikely that any of these would be used exclusively by an ARV treatment program. Think of a hospital as representing a fixed amount of health care capacity. Some part of the capacity that a hospital represents would be reserved for health care services other than ARV therapy. To estimate the capital costs associated with a treatment program, the ATC therefore requires an estimate of the number of hospitals (and other items) that an ARV treatment program might use. It also requires users to estimate the percent utilization of the capacity represented by the building; that is the percent that would be allocated to an ARV treatment program.

For each type of building listed in the *Capital Items* screen, indicate how many such buildings will be used by an ARV treatment program, and estimate percent utilization of each building type. For the case of equipment and vehicles, estimate the percent utilization as well.

When you select *Capital Item Requirements* from the *Cost Data* screen, the ATC model first allows you to choose from among the three types of capital items.



If you select Buildings, the ATC generates the following screen.



For example, specifying two laboratories at 30 percent utilization will entail the same costs as one laboratory at 60

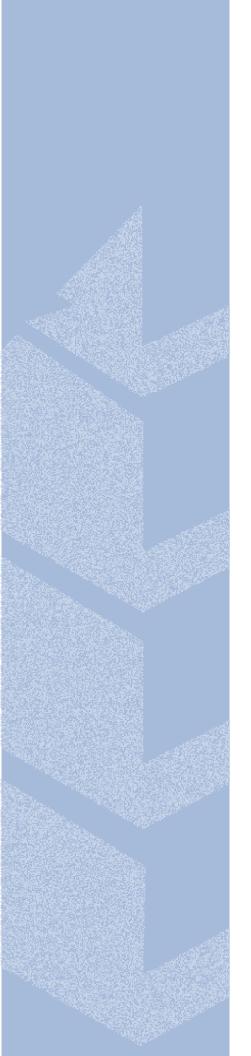
percent utilization.

For vehicles and durable equipment, the ATC generates similar screens.





- 1. In these screens you need to enter the following data:
  - a. For each item, how many will be used by an ARV treatment program; enter these data as integers.
  - b. What percent of theim will be used by the program.
  - c. Values for percent utilization are to be entered as whole percents and should lie between zero and 100.
- 2. To enter data on the number and percent utilization of these capital items, select them from the screen titled *Select Requirements For*.



# CHAPTER 8 DRUG CONFLICTS

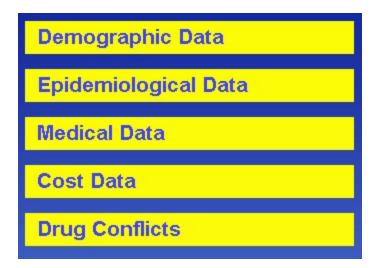
8.1 OI-ARV Conflicts

8.2 ARV-ARV Conflicts

### CHAPTER 8 DRUG CONFLICTS

- Drug conflicts indicate pairs of drugs that patients cannot receive simultaneously. Some of these are conflicts between pairs of ARV drugs; others concern conflicts between ARV drugs and drugs used to treat OIs.
- 1. Enter drug conflicts using the dropdown menus in the *Drug Conflicts* screens.

Among the *Baseline Data*, the final set of data to specify are treatment and drug conflicts. Recall, the menu from the *Baseline Data* screen:



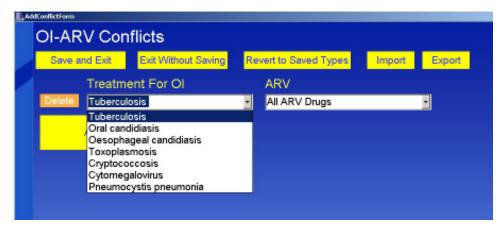
Some ARV drug therapies cannot be given simultaneously to any one patient. Others cannot be given to patients who are being treated for OIs. In the ATC model, these are referred to as *Drug Conflicts*. There are two kinds of conflicts to consider. First, an ARV treatment program might stipulate that someone who was being treated for a given OI would receive *no* ARV treatment; they would be treated for the infection alone. Second, some drugs used to treat AIDS cannot be given simultaneously to a single patient.

To specify treatment and drug conflicts, select *Drug Conflicts* from the *Baseline Data* screen. This produces a screen providing you with two options, *OI-ARV Conflicts* and *ARV-ARV Conflicts*.



#### 8. I OI-ARV CONFLICTS

In the course of specifying *Medical Data*, you specified the list of OIs that an ARV program might treat. Selecting *OI-ARV Conflicts* allows you to say which of the OIs cannot be treated at the same time as AIDS is treated.



- 1. Select the inverted triangle on the right in the space under the heading *Treatment for OI*; this will produce a dropdown menu.
- 2. Select an OI from the dropdown menu—the menu will highlight the name of the infection.

3. Select Add New Conflict and repeat this for as many of the opportunistic infections as you wish to render incompatible with ARV treatment. When you run the Scenario Editor, the ATC will not permit you to define scenarios in which these infections are treated alongside ARV treatment.

In the example screen below, only treatment of tuberculosis is incompatible with ARV drug therapy.



Tip

The ATC treats the OIs that you select as incompatible with all ARV drugs; you cannot specify incompatibility between treatment of OIs and specific ARV drugs.

### 8.2 ARV-ARV CONFLICTS

- 1. To specify pairs of ARV drugs that conflict with one another, select *Drug Conflicts* from the *Medical Data* screen; then select *ARV-ARV Conflicts*.
- 2. Select pairs of drugs that conflict with one another using the dropdown menus.

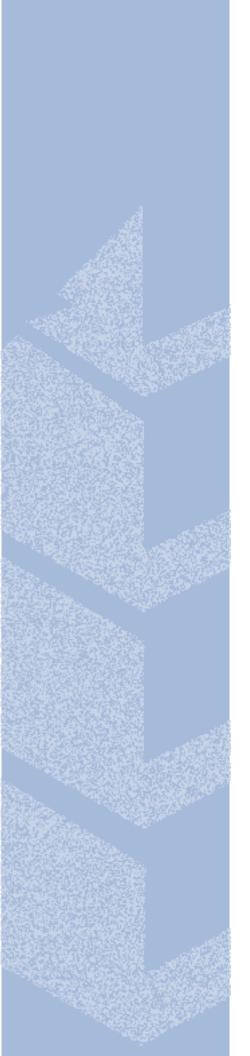
As with *OI-ARV Conflicts*, the screen for specifying ARV-ARV drug conflicts allows you to choose pairs of drugs by means of dropdown menus.



In the case of OI-ARV conflicts, only the menu for the left column has more than one element in it; the menu in the right column allows you only to select *All ARV Drugs*. In the case of ARV-ARV conflicts, both columns allow you to choose from among all of the ARV drugs that you specify as part of *Medical Data*. This allows you to declare specific pairs of drugs incompatible.

Use these menus to indicate all pairs of incompatible ARV drugs from among those you listed as part of *Medical Data*.





# CHAPTER 9 CREATING A SCENARIO

9.1 Load Baseline Data

### CHAPTER 9 CREATING A SCENARIO

The Baseline Data that you entered earlier help define a universe of possible programs. In other words, they specify demographic and epidemiological facts that any ARV treatment program would confront, as well as facts about the medical infrastructure in a certain country. But these data do not define an ARV treatment program. They do not define a specific set of policies for treating HIV/AIDS. You are able to define such a program by creating a scenario in the ATC. A scenario is a set of assumptions that defines a program for treating HIV/AIDS. It defines a single program whose associated costs and resource requirements will be evaluated by the ATC. The Scenario Editor allows you to define and save such programs.

Once you have a complete set of Baseline Data, return to the second screen of the ATC model to start the Scenario Editor.



Select Create New Scenario to start the Scenario Editor.

#### TIP

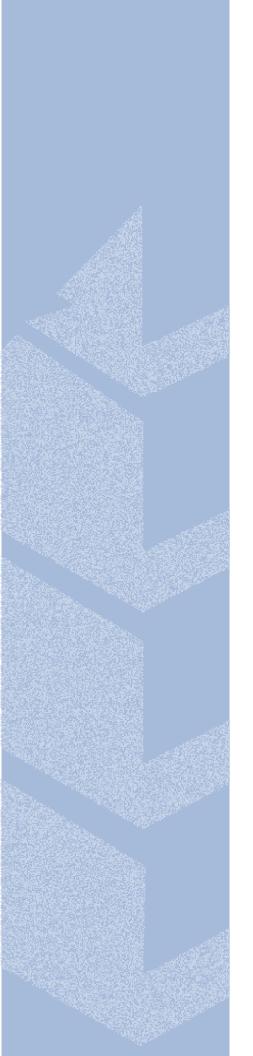
The scenario that you define will be based on the data set that you select when you begin to define the scenario. In order to run the scenario using different baseline data, you will need to redefine the scenario from the beginning.

### 9. I LOAD BASELINE DATA

- 1. After selecting *Create New Scenario*, load a saved *Baseline Data* set.
- 2. Select this from the menu on the screen entitled *Select Baseline Data*.
- 3. Then select Next.



In order to define and evaluate a scenario in the Scenario Editor, you need to load a saved *Baseline Data* set. The scenario that you define will use these data and no other. You should think of your scenario as a possible scenario *given the assumptions made in the baseline data that you selected*. Select the dropdown menu in the screen above, and select the name of a previously-saved data set. In the case above, the selected baseline data set is entitled data\_simulation\_1.



## CHAPTER IO SELECT ELEGIBLE POPULATION

- 10.1 Access to Care—Incomplete
- 10.2 Access to Care
- 10.3 Screening Uptake Rate
- 10.4 Initial Prevalence
- 10.5 Initial Diagnosis Rate
- 10.6 Confirmation Test Uptake Rate
- 10.7 Distribution by Facility Type (for Testing)
- 10.8 MTCT Facility Use
- 10.9 ARV Facility Use
- 10.10 OI Facility Use
- 10.11 Access to Care Complete
- 10.12 Save Scenario in Progress

### CHAPTER IO SELECT ELIGIBLE POPULATION(S)

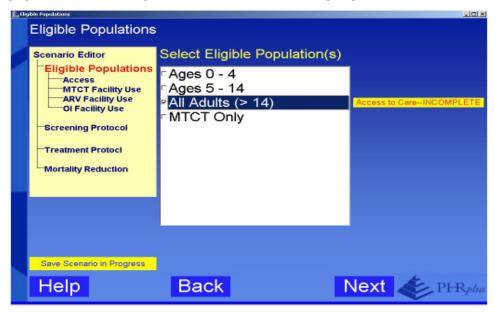
- Eligible Populations are demographic groups that you declare eligible for treatment in a given treatment scenario (from among those that you defined in baseline data).
- 1. Define a population as eligible for treatment by selecting it in the screen titled *Select Eligible Population(s)*.

In general, the ATC allows you to define more than one population at a time as being eligible for treatment in a given scenario, but populations that you select must be mutually exclusive; they cannot overlap.

The first thing to do in defining a treatment scenario is to define population groups that will be eligible for treatment. Not every possible program for treating HIV/AIDS will treat all members of a population. Some programs might target only adults for treatment; others might attempt only to prevent MTCT of HIV. The Scenario Editor begins by asking you to specify groups eligible for treatment.

When you select *Next* in the *New Scenario* screen, the ATC generates a screen where you select eligible populations. Note that the options that you see here will be exactly those that you entered as eligible populations in the Baseline Data editor, as part of your *Demographic Data*.

In the following scenario, all adults—defined as all members of the population over the age of 14—are defined as being eligible for treatment.



You must enter data for each population until the screen on the previous page indicates *Access to Care—Complete* for each population that you declare eligible.

#### IO. I ACCESS TO CARE-INCOMPLETE

- 1. Upon selecting a population, if the button immediately to the right says *Access to Care-Incomplete*, select that button and enter data.
- 2. If the buttons next to all selected populations say Access to Care-Complete, select Next.

For each population that you specify as eligible for treatment, the ATC requires you to enter data regarding that population's access to care. For purposes of the ATC, access to care includes:

- Access rate: This is the percent of an eligible population that has access to medical care. Enter these data in percents. Values should lie between zero and 100.
- **Types of treatment** for which a given population is eligible. Select treatments from those listed, using the cursor.
- **Uptake rates**: In general, an uptake rate is the percent of those eligible who accept or use a service. A Screening Test Uptake rate, for example, is the percent of those eligible who will accept screening services. Enter these data as percents. Values should lie between zero and 100.
- **Initial prevalence rate:** The prevalence of a disease is the percent of the population that has contracted the disease. The ATC calculates prevalence rates using data for a specific eligible population. Values should lie between zero and 100.
- **Initial diagnosis rate:** This is the percent of patients screening positive for HIV, among those who accept screening for HIV. Enter these data as percents. Values should lie between zero and 100.
- **Distribution across facility types:** For each type of facility, this is the percent of the eligible population receiving care at a facility of that type. Enter these data as percents. Values should lie between zero and 100 and should add to 100.

You begin to enter these data by selecting the *Access to Care—Incomplete* button in the screen above. In this example, all population over the age of 14 is defined as eligible. To the right of the population name, the ATC indicates that its information on this population is not complete. Select the *Access to Care—Incomplete* button to begin entering data.

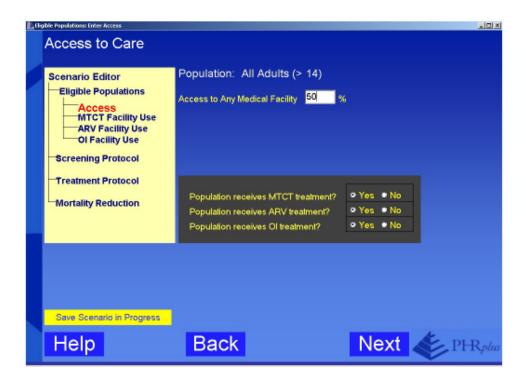
#### 10.2 ACCESS TO CARE

- 1. In the screen titled *Access to Care*, enter the percent of the eligible population that has access to any medical care.
- 2. The percent with access to any medical care is to be entered as integer percents, with values between zero and 100.
- 3. Round these values to the nearest whole percent.

- 4. Specify the types of treatment that this eligible population is to receive.
- 5. Select *Next* after entering the percent with access and selecting types of treatment.

To specify, for example, that all adults in a population are *eligible* for treatment does not imply that all of them have access to treatment. Decisions regarding eligibility are *policy* decisions. Someone might be eligible for treatment under a given policy and not have access to health care by virtue of living in remote areas not served by any health care facility. The ATC takes this into account by requiring users to indicate the percent of the eligible population that is assumed to have access to some health care facility.

Not all populations need be eligible for the same types of treatment; this, too, is a policy decision. In some cases, this decision is obvious: males are not eligible for treatment to prevent MTCT of HIV, and MTCT Only populations are eligible only for this kind of treatment. Nonetheless, each population that you declare eligible, the ATC requires you to indicate the types of treatment for which it is eligible.



In the example above, 50 percent of all adults have access to some medical facility. The population has also been defined as eligible for all types of treatment—i.e., MTCT, ARV, and treatment for OIs.

Tip

MTCT Only populations can receive only MTCT.Populations consisting only of males and children cannot receive MTCT.

#### 10.3 SCREENING UPTAKE RATE

- The Screening Uptake Rate is the percent of the eligible population who accept screening services.
- 1. Enter these data as whole percents. Values should lie between zero and 100.

The ATC assumes that screening for HIV includes three activities: initial screening; confirmation, in cases where a patient tests positive on the initial screening; and pre- and post-test counseling. Not everyone who is eligible and has access to screening services will accept them. The screening uptake rate is the percent who accept such services, among those who are eligible and have access.

#### 10.4 Initial Prevalence

 Initial Prevalence is the percent of the population who are HIV+ in year 1 of the ATC's estimates.

The figure that you see for *Initial Prevalence* in the *Access to Care* screen is determined by data that you entered as part of *Baseline Data*. You do not enter data for *Initial Prevalence* in the Scenario Editor.

#### IO.5 INITIAL DIAGNOSIS RATE

- The *Initial Diagnosis Rate* is the percent, of those who are screened, who will test positive for HIV.
- 1. Enter these data as percents, possibly including fractional percents. Values should lie between zero and 100.

HIV may be more (or less) prevalent in the population who accept screening tests for HIV than in the eligible population as a whole. The ATC allows you to specify a diagnosis rate for each eligible population that differs from the prevalence of HIV in that population.

#### 10.6 CONFIRMATION TEST UPTAKE RATE

- The Confirmation Test Uptake Rate is the percent, of those testing HIV+ on an initial screening test, who accept a confirmation test.
- 1. Enter these data as whole percents. Values should lie between zero and 100.

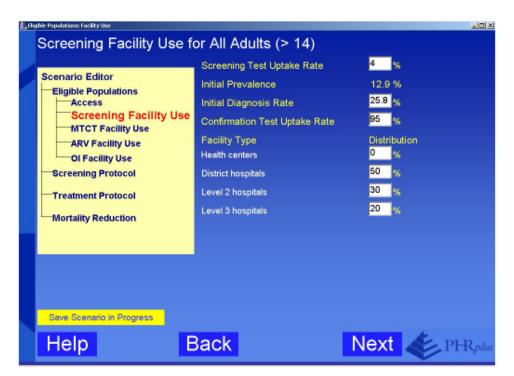
Not everyone who tests HIV+ on an initial screening test will accept a confirmation test. The ATC allows you to specify the percent who will.

### IO.7 DISTRIBUTION BY FACILITY TYPE (FOR

#### TESTING)

- 1. For each type of facility, indicate the percent of those tested who receive screening and confirmation services at that type of facility.
- 2. Enter data as values between zero and 100 (inclusive).
- 3. You must round to the nearest whole percent; fractional percents like 40.75 are not permitted.

Everyone in the eligible population who is screened for HIV must be screened at a facility belonging to one of the types that you identified in the Baseline Data. But not all of the eligible populations need to be tested at the same type of facility, and the cost of the scenario that you define is determined, in part, by the distribution of people tested across facilities. Cost depends on this distribution because the ATC assumes that the wages of health care staff can vary by facility type.

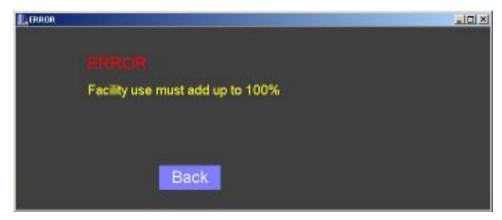


In the screen above, zero percent of the eligible population who are screened are tested at health centers, 50 percent are tested at district hospitals, 30 percent at level 2 hospitals, and 20 percent at level 3 hospitals. Note that the total of these figures equals 100. Had it not done so, the ATC would have generated the error message:

Tip

The total across facility types must equal 100.

In the event of such an error message, select  ${\it Back}$  and correct the data that you enter.

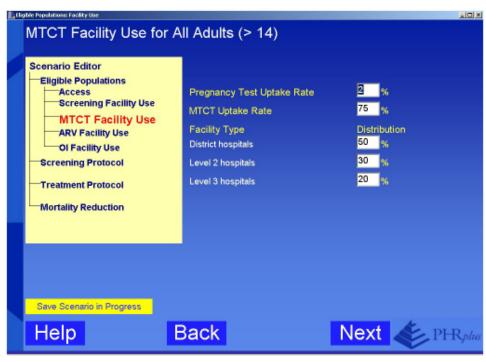


If you wish to consider a scenario in which some types of facilities do not offer screening services, enter the value zero for those facilities.

#### 10.8 MTCT FACILITY USE

- The next step is to say, for each type of treatment that your population is eligible to receive:
  - What percent actually will receive treatment—this is the treatment uptake rate
  - How are patients who receive treatment distributed across types of facility.

In the previous example, the population is eligible for all types of treatment. The first such type is MTCT treatment. To enter scenario data for MTCT treatment, select *Next* in the screen titled *Screening Facility Use*.



\ Tip

In this case, the percentages that you enter for the remaining facility types must still total 100.

- The *Pregnancy Test Uptake Rate* is the percentage of women in the population who:
  - Are in a population eligible for MTCT treatment (in this example, all adults),
  - O Have access to medical care,
  - Are HIV+, and
  - Actually receive pregnancy testing to see whether they are at risk of passing HIV to their unborn children.
  - Values for Pregnancy Uptake Rate should lie between zero and 100 (inclusive), and should be rounded to the nearest whole percent.
- The MTCT Uptake Rate is the percent of women who:
  - Are in a population eligible for MTCT treatment (again, in this example, all adults),
  - O Have access to medical care,
  - Test positive for HIV,
  - Have a child some time in the current year, and
  - Actually receive MTCT.
  - Values for the MTCT Uptake Rate should lie between zero and 100 (inclusive), and should be rounded to the nearest whole percent.

The Distribution among Facilities for MTCT Treatment indicates how individuals who are actually receiving MTCT treatment are distributed across facility types.

The ATC model assumes that pregnancy testing is part of an MTCT testing program, since a woman will receive MTCT only if she tests positive for HIV and is pregnant. The cost of pregnancy testing, therefore, is part of the cost of providing MTCT treatment. It is reasonable for an ARV treatment program to test for pregnancy if someone is female, in an eligible population, fertile—ages 15-45 from the *Baseline Data*—and has tested positive for HIV. Not all such women will agree to be tested, however. Moreover, many HIV+ women will be treated when they deliver, at which point there will be no need to give a pregnancy test. The screen above requires users to enter an assumed rate at which eligible, HIV+ women actually will be tested for pregnancy.

An ARV treatment program will provide MTCT treatment to someone if she is female, in an eligible population, is pregnant and has tested positive for HIV. The ATC assumes that anyone in a given year who has a child and tested positive for HIV, will have been identified as a candidate for MTCT treatment—since it will be obvious that she was pregnant. Once again, not all women who are candidates for MTCT treatment actually will receive treatment to prevent MTCT; some women will refuse it. The ATC, therefore,

Tip

Not all facilities that provide screening must also provide treatment, so this distribution can differ from the distribution of the population across facility types for screening tests.

Tie

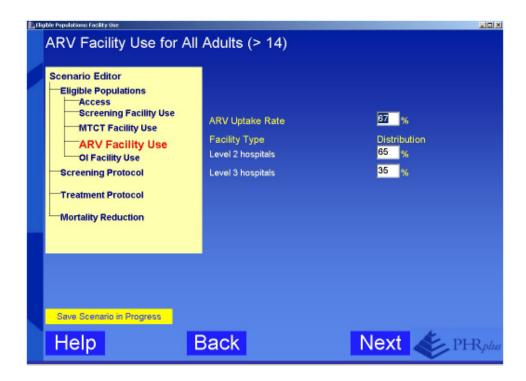
In all cases, the ATC model assigns the cost of MTCT treatment to the year in which a woman actually gives birth.

requires you to indicate the percentage of candidate women who will receive MTCT treatment. This is the MTCT Uptake Rate.

#### 10.9 ARV FACILITY USE

- The ARV Uptake Rate is the percent of individuals who:
  - Are HIV+,
  - Have AIDS, and
  - Actually receive ARV treatment.
  - Values for this uptake rate must like between zero and 100, and must be entered rounding to the nearest whole percent.
- The distribution among facilities for ARV treatment indicates the percent receiving treatment at each type of facility, among those actually receiving treatment.
  - Values for this distribution must lie between zero and 100 (inclusive) and be rounded to the nearest whole percent.
  - Values for this distribution must total 100.

In the previous example, all adults were eligible for all types of treatment (for which they qualify). Therefore, data must be entered for access rate for ARV treatment and treatment for OIs. After entering data on MTCT uptake rate and facility use, select *Next* to indicate ARV uptake rate and facility use.



The ATC model assumes that a person is a candidate for ARV treatment only if he or she is in an eligible population, has access to health care, is HIV+, and has systematic AIDS. It does not assume that every such person will receive ARV treatment. The ATC model thus requires users to specify the percent that actually receives treatment, among those who are candidates for ARV treatment. This is the ARV Uptake Rate.

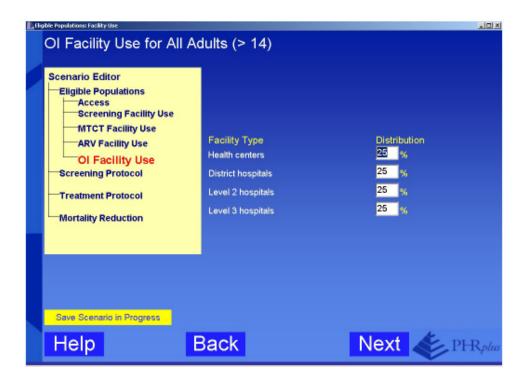
The ATC model also assumes that people may receive ARV treatment at more than one type of facility. The model requires you to indicate how those people who are actually receiving ARV treatment are distributed across facility types.

#### Tip

Not all values entered for this distribution need be greater than zero.

#### 10.10 OI FACILITY USE

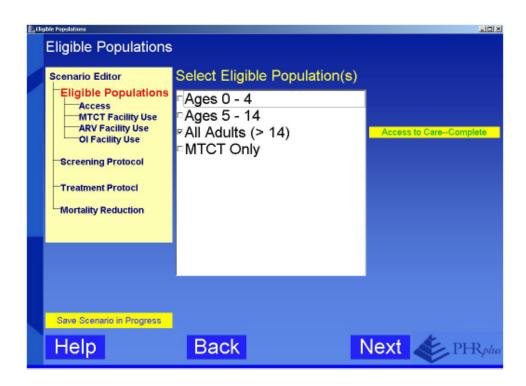
- The distribution among facilities for opportunistic infection indicates, for those receiving such treatment, the percent receiving it at each type of facility.
  - Values for these data should lie between zero and 100, and should be rounded to the nearest whole percent.
  - Data entered in this screen should total 100.



You will notice that the ATC does not ask for an uptake rate for treatment for opportunistic infections. This is because the ATC assumes that the uptake rate for ARV therapy also applies for opportunistic infections. In cases where your scenario assumes that OIs are treated but that there is no ARV therapy, the ATC will ask for an uptake rate for OI treatment.

#### IO. I I ACCESS TO CARE COMPLETE

Once you complete the *Access to Care* screens above, select *Next* to return to the *Eligible Populations* screen.



The Scenario Editor requires you to specify Access to Care for each Eligible Population. You have not completely specified a scenario unless you have done this, and the ATC will not allow you to proceed.

ΠP

To the right of "All Adults (> 14)" the button now reads Access to Care—Complete.

If more than one (non-overlapping) eligible population were selected, there would have been a second button for the other eligible population indicating Access to Care—Incomplete, and you would need to go through the steps above for that population as well.

#### 10.12 SAVE SCENARIO IN PROGRESS

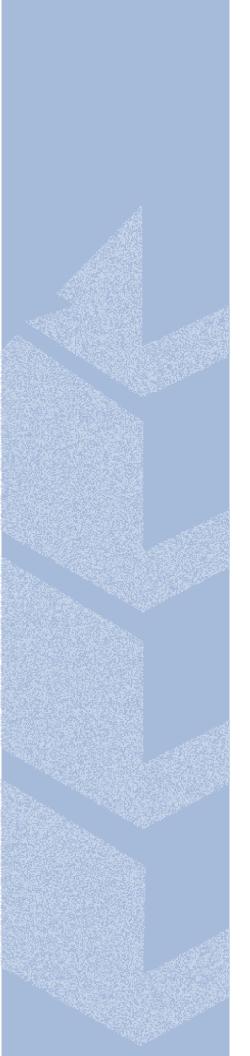
1. To save an incomplete scenario and complete it later, select *Save Scenario in Progress*.

If you need to end your ATC session before completing a scenario and want to save your work, select *Save Scenario in Progress*. The ATC will save the scenario that you began. When you restart the ATC, select *Resume Scenario in Progress* from the screen on the next page, and the ATC will return you to the point in your incomplete scenario where you last entered data.



Tir

The incomplete scenario will be saved under the file name *Progress*. This will appear in the scenario sub-directory.



# CHAPTER I I HIV SCREENING PROTOCOL

- 11.1 Pre-Test Counseling
- 11.2 Screening Staffing Model
- 11.3 HIV Screening Test
- 11.4 Post-Test Counseling
- 11.5 Confirmation Staffing Model
- 11.6 HIV Confirmation Test

## CHAPTER I I HIV SCREENING PROTOCOL

The next task in developing a scenario in the ATC is to specify an HIV screening protocol. This consists of six steps:

- Pre-Test Counseling: This indicates the number of minutes that staff spend in counseling patients prior to their HIV screening test.
- Screening Test Staffing Model: This indicates how many minutes staff of each type spend in testing a single patient.
- HIV Screening Test: This indicates the type of HIV screening test, or tests, to be used in the scenario.
- Post-test Counseling: This indicates the number of minutes that counseling staff spend counseling patients after their initial HIV screening test.
- Confirmation Test Staffing Model: In cases where patients test
  positive for HIV, there may be an HIV confirmation test. This
  staffing model indicates the number of minutes that each type of
  staff will spend in providing a confirmation test for a single patient.
- **HIV Confirmation Test:** This indicates the test to be used for confirmation testing.

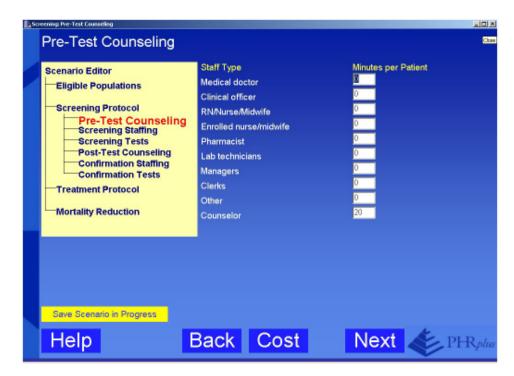
#### II.I Pre-Test Counseling

- For each type of staff, indicate the number of minutes that staff of each type spend counseling a single patient before he or she is tested for HIV.
- 2. Values here should be integers greater than or equal to zero (inclusive).

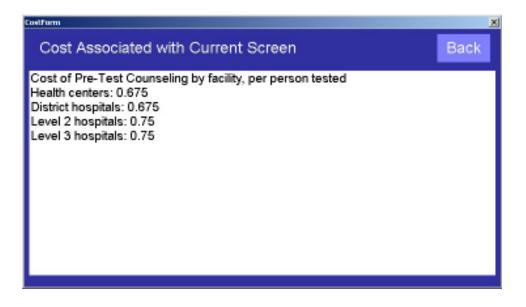
In the *Baseline Data*, users indicate the types of staff that might participate in an ARV treatment program. The cost of an ARV program will depend, in part, on how much time these staff spend counseling patients. For this reason, the ATC requires you to indicate the number of minutes spent by each type of staff providing pre-test counseling. In some scenarios, you may want to assume that staff of some types play no role in counseling. In that case, enter zero in the screen above.

Tir

Types of staff that you see on the screen below are determined in the *Baseline Data*.



This screen allows you to see the cost implications of the data that you enter in the screen above. Select *Cost* to see the implied *per person* cost of a single counseling session, by facility type. If staff compensation are assumed to vary by facility type, the implied per person cost of counseling will vary by facility type as well.



Tip

If the per person cost associated with counseling is sufficiently small, the ATC will round this number to zero. This does not imply that staff time for counseling will not enter into total cost.

#### 11.2 SCREENING STAFFING MODEL

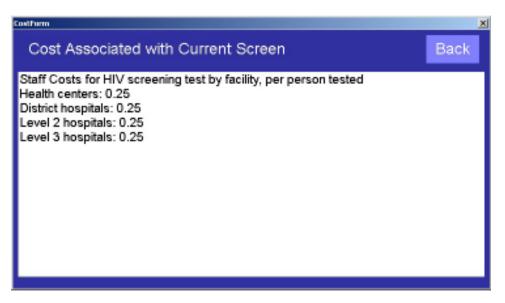
- The Screening Staffing Model indicates how much time each type of staff specified in the Baseline Data spends screening a single patient.
- Values for this staffing model are amounts of time in minutes, rounded to the nearest whole number.

The cost of screening is determined in part by the amount of staff time required to screen a single patient. To the extent that staff with higher wages spend more time in screening a patient, screening services will be more expensive. The ATC requires you to indicate how much time is required of each type of staff to screen a single patient. Note that time is to be specified in minutes rounded to the nearest whole number. The time required can vary across staff. Indeed, it is reasonable to believe that some will spend no time at all in screening for HIV.



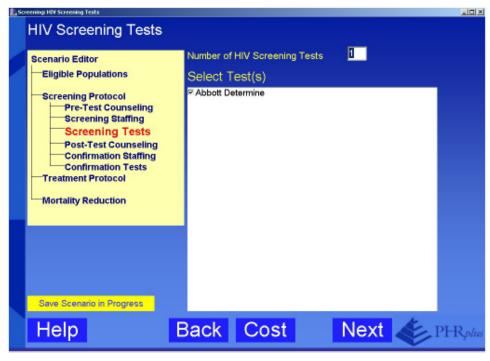
As in the previous screen, you can see the implied staff cost of screening a single patient. Roughly, this is the staff time, multiplied by staff compensation, divided by the number of patients. The ATC model generates the estimated labor cost of screening by facility type, to reflect the fact that wages can vary by type of facility—as indicated in the *Cost Data*. In the

example below, wages do not vary by facility type. Therefore, the costs associated with the staffing model do not vary across facility types.



#### I I.3 HIV SCREENING TEST

- The HIV Screening Test screen allows you to select the number of tests to be administered when a patient is initially screened for HIV.
- It also requires you to identify the specific tests to be used.



This example scenario above assumes that initial testing will employ a single test.

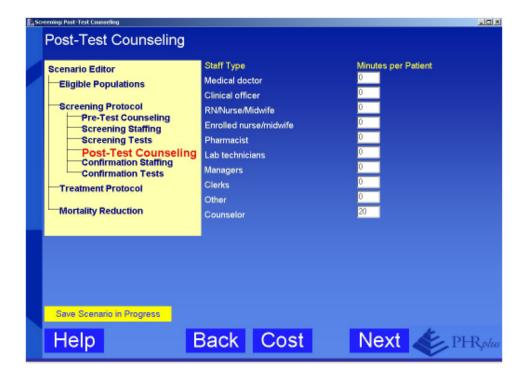
Tie

The list of possible screening tests that you see on this screen is determined by the list of possible screening tests that you entered in the *Medical Data* screen in the *Baseline Data Editor*. In this case, only one was listed.

Note that, as with the staffing model screens, this screen allows you to see the implied per person cost associated with the initial HIV testing regime that you define here. Selecting *Cost* returns an estimated cost.

#### 11.4 Post-Test Counseling

- Post-Test Counseling specifies the number of minutes that each type of staff who provides counseling spends with each patient.
- Values for post-test counseling are time in minutes.
- Values for post-test counseling should be greater than or equal to zero.



#### 11.5 CONFIRMATION STAFFING MODEL

- The Confirmation Staffing Model specifies the amount of time that each type of staff spends per patient as part of confirmation testing.
- Values for these times are specified in minutes, with values greater than or equal to zero.
- Values may vary by staff type.

An ARV treatment program may provide one or more confirmation tests for those who test positive for HIV on their initial test. These tests must have a staffing model, indicating the number of minutes that each type of staff spends per patient on confirmation testing.

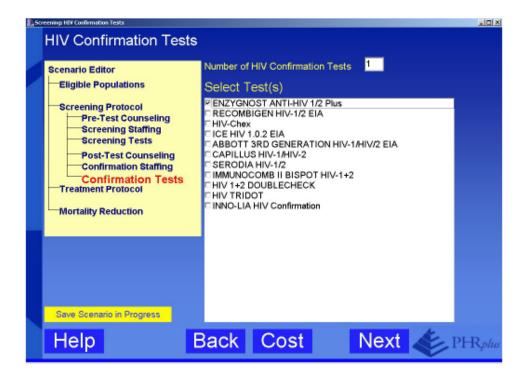


#### II.6 HIV CONFIRMATION TEST

- The HIV Confirmation Test screen requires you to specify how many HIV tests are used to confirm an initial positive HIV screening test.
- Values for the number of tests should be positive integers.

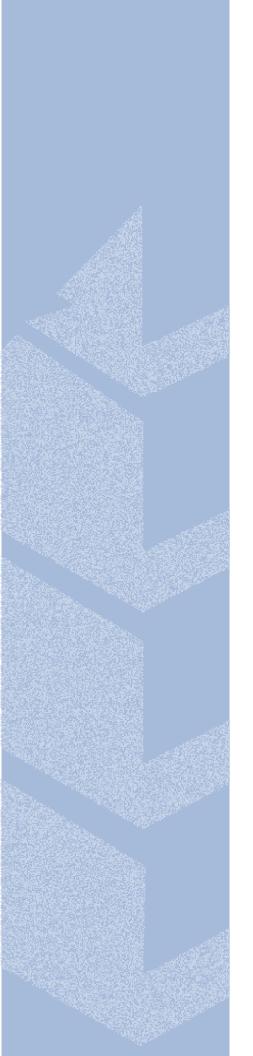
This screen also requires you to indicate which tests are to be used in the scenario that they are defining.

The number of tests selected in the menu below must correspond to the number of confirmation tests that you indicate.



Tip

In the example on the next page, there are many possible confirmation tests. This is not true in the other example presented previously based on data\_simulation\_1. Had there been more than one confirmation test listed in that Baseline Data, the menu of possible tests would appear like the one on the following page.



# CHAPTER 12 TREATMENT PROTOCOLS: MTCT

12.1 Pregnancy Test Staffing Model

12.2 MTCT Staffing Model

12.3 MTCT Treatment Regimen

12.4 Transmission Probabilities

### CHAPTER | 2

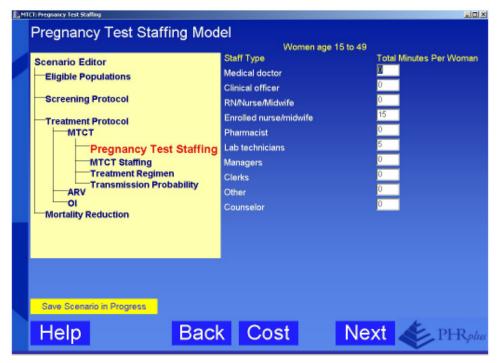
#### TREATMENT PROTOCOLS: MTCT

- After specifying HIV screening test protocols, you need to specify treatment protocols. As in the screening section, this section of the ATC requires you to specify:
  - Staffing models, and
  - Treatments for each service that your scenario allows.

In the example scenario, the eligible population was assumed to receive all three types of treatment—treatment to prevent MTCT , ARV treatment, and treatment for OIs. At this point, the ATC asks you to begin by specifying the protocol for treatment to prevent MTCT of HIV.

#### 12.1 Pregnancy Test Staffing Model

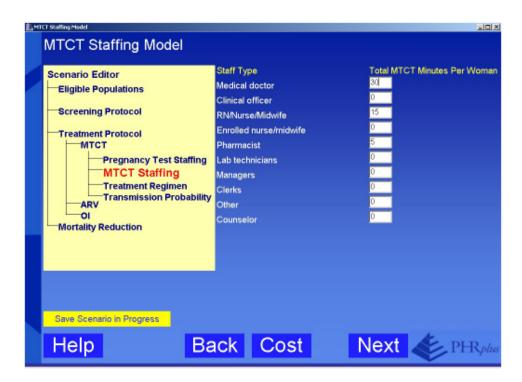
- The Pregnancy Test Staffing Model specifies how much time each type of staff spends per patient to provide pregnancy testing.
  - Values for these data are in minutes.
  - These values should be greater than zero and should be rounded to the nearest whole minute.



Pregnancy testing is part of an MTCT treatment protocol. This will entail costs for the test itself and for the labor required to administer the test. The staffing model indicates how much labor of each type is assumed to be used in pregnancy testing.

#### 12.2 MTCT STAFFING MODEL

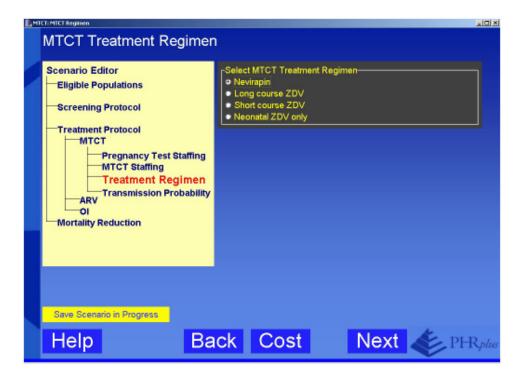
- The MTCT Staffing Model specifies how much time each type of staff spends per patient in providing treatment to prevent MTCT.
  - Values for these data are in minutes.
  - These values should be greater than zero and should be rounded to the nearest whole minute.



The MTCT staffing model indicates the labor time per patient associated with providing MTCT treatment. In this example scenario, the MTCT staffing model requires 30 minutes of time from a physician, 15 minutes from a Registered Nurse, and 5 minutes from a pharmacist per patient.

#### 12.3 MTCT TREATMENT REGIMEN

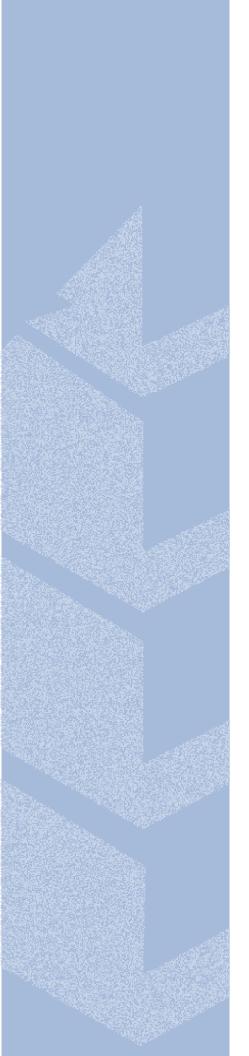
- An MTCT Treatment Regimen is the course of treatment that pregnant HIV+ women will receive as defined by a policy scenario.
- You may indicate only one such regimen.



When you entered *Medical Assumptions*, you indicated a set of possible treatment regimens to prevent MTCT. As part of a scenario, the ATC requires you to indicate which regimen patients will receive for MTCT.

#### 12.4 TRANSMISSION PROBABILITIES

- The Transmission Probabilities that you specify for MTCT is the likelihood of MTCT for a pregnant, HIV+ woman who receives treatment.
  - Values for transmission probabilities should lie between zero and 100 and can take fractional values.



# CHAPTER I 3 TREATMENT PROTOCOLS: ARV

- 13.1 ARV Staffing Model
- 13.2 Annual Tests for People Receiving ARV or OI
  Treatment
- 13.3 ARV Treatment: Number of lines of treatment
- 13.4 ARV Treatment: ARV Protocol Line 1
- 13.5 ARV Treatment: ARV Protocol Line 2
- 13.6 Opportunistic Infections Protocol
- 13.7 Opportunistic Infections Protocol: Tuberculosis
- 13.8 Opportunistic Infections Protocol: Staffing Model for Tuberculosis
- 13.9 Opportunistic Infections Protocol: Drug Selection for Tuberculosis
- 13.10 Opportunistic Infection Protocols: Treatment Protocol Complete
- 13.11 AIDS Mortality Reduction Due to Treatment 1
- 13.12 Save Scenario

### CHAPTER 13

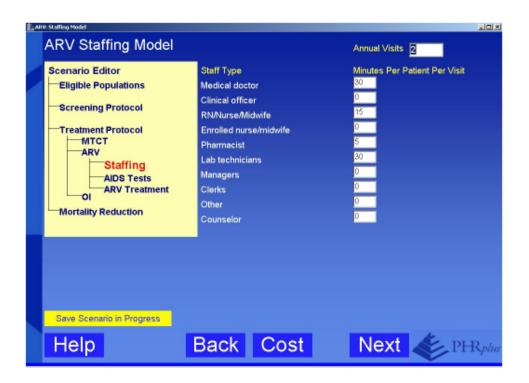
#### TREATMENT PROTOCOLS: ARV

The second protocol to specify is the protocol for providing ARV treatment. You will specify an ARV treatment protocol in a similar way to how you specified the MTCT treatment protocol. For the scenario that you define, the ATC requires you to indicate:

- A Staffing Model for ARV treatment,
- A specification of annual tests to be administered to patients receiving ARV treatment, and
- The ARV drugs that patients receive.

#### 13.1 ARV STAFFING MODEL

- The ARV Staffing Model specifies the number of annual visits that patients make to an ARV treatment facility as part of their treatment.
  - Values for this number are integers greater than or equal to zero.
- The ARV Staffing Model also specifies how much time each type of staff spends per patient in providing ARV treatment.



- Values for these data are in minutes.
- These values should be greater than zero and should be rounded to the nearest whole minute.

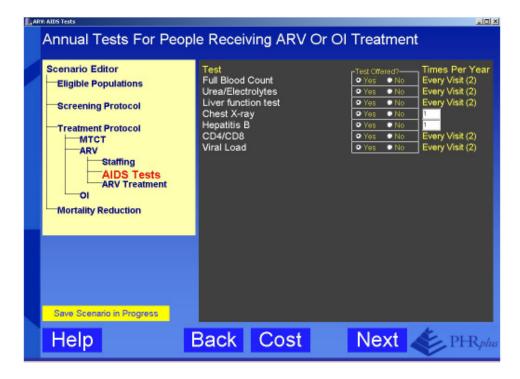
Any ARV treatment program will assume some number of visits that patients make annually in the course of their ARV treatment. These typically will include both tests and treatment. The staffing model indicates how many visits patients make per year, and the amount of time each type of staff spends per patient per visit. This is crucial both to determine labor costs associated with the program, as well as costs associated with testing and treatment.

In the example on the previous page, patients are assumed to visit an ARV treatment facility every six months, and staff are assumed to spend the indicated times per patient per visit.

### I 3.2 ANNUAL TESTS FOR PEOPLE RECEIVING ARV OR OI TREATMENT

- Annual Tests are tests administered to patients receiving ARV treatment.
- 1. Select those to be administered in the scenario that you define.
- 2. For each test, indicate the number of times a patient is tested. In cases where *Baseline Data* stipulate that a test is given on every visit, the ATC will give you no option.

Part of the ARV treatment protocol is specifying the tests that patients being treated with ARVs will receive, and the number of annual visits during which they receive these tests. In the course of specifying *Baseline Data*, you



specified a list of possible tests. These were tests that a program providing ARV treatment might elect to administer during one or more visits that AIDS patients make over the course of a year as part of their treatment. In the screen below, the ATC requires you to select the tests that patients will receive.

In the Baseline Data, you also indicated whether patients would receive each test on every visit. For tests not necessarily given on every visit, the ATC requires you to indicate how often patients will receive those tests. The maximum number, in this case, is the number of visits per year specified in the preceding screen.

### 13.3 ARV TREATMENT: NUMBER OF LINES OF TREATMENT

- The number of lines of ARV Treatment is the number of ARV treatment protocols that patients may receive as initial (and subsequent) protocols become ineffective.
- 1. Use the cursor to select the number of lines of treatment.



In the course of ARV treatment, the first treatment protocol may eventually become ineffective for some patients. The ATC permits you to specify scenarios in which patients may receive further treatment. In scenarios that offer a single protocol, patients for whom that protocol becomes ineffective cease receiving ARV treatment. In scenarios that offer more than one line of treatment, patients cease to receive ARV treatment only when all protocols have become ineffective.

To calculate the number of patients who move from a first protocol to a second, the ATC requires you to indicate whether your scenario assumes more than one line of treatment. In the example scenario represented above, only one line of ARV treatment is offered.

#### 13.4 ARV TREATMENT: ARV PROTOCOL LINE 1

- The Annual Attrition Rate is the percent of patients for whom this line of treatment will become ineffective in a given year (among those receiving the treatment).
  - Values for this rate should be integers between zero and 100 and should be rounded to the nearest whole percent.
- 1. To specify the first protocol, indicate the types of drugs in the protocol using the cursor.
  - a. Specify the precise drugs to be used in the protocol. The drugs that you choose should be of *the exact number and types* corresponding to the protocol that you select.
  - b. Make certain that the drugs that you specify are compatible.
  - c. Any two drugs with an asterisk followed by the same number—e.g. \*2—are not compatible. (Recall that you specified which drugs are incompatible as part of the *Baseline Data*.)

The ATC requires that you specify an ARV treatment protocol. In the screen below, there are three possible protocols; this list is determined by the *Medical Data* that you specified in the *Baseline Data Editor*. For each protocol, you need to select drugs of the relevant types. You also need to specify an attrition rate.



ı Tip

Pediatric drugs are labelled with the letters "ped". Do not select non-pediatric drugs for a pediatric population.

If any ARV-eligible population contains children, then all drugs selected must be pediatric.

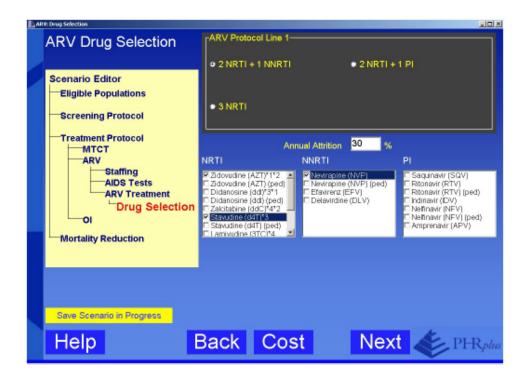
In the Baseline Data Editor, you specified ARV-ARV drug conflicts. In the screen above, drugs have been selected to be part of the Line 1 protocol. Note that \*2 occurs after the first of the NRTI drugs selected above. This means that this drug is incompatible with any other drug also followed by \*2. In general, when two drugs are followed by an asterisk and the same number, they are not compatible. The ATC will alert you to the fact that you have chosen incompatible drugs. This is evident when you select Next, which causes the ATC to produce an error message informing us of our mistake. If you see such an error message, select Back in the error message, and reselect compatible ARV drugs.

To remedy the problem, reselect different drugs.



After the name of the first drug selected (Zidovudine,) there are both a \*1 and \*2. Following the name of the second drug selected (Stavudine,) there is a \*3. However, there is neither a \*1 or \*2. Therefore, there is no incompatibility.

However, another problem arises. Although the protocol selected consists of  $2\ NRTI + 1\ NNRTI$  drugs, the drugs selected are all NRTI drugs. The drug selection is thus not compatible with the protocol selected. The ATC will alert you to this error as well, by producing an error message. You can correct this by deleting one of the drug selections (without introducing incompatibility).

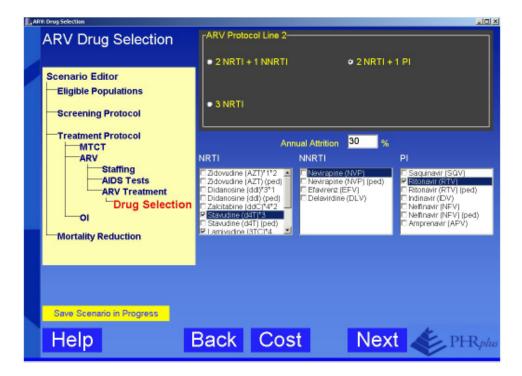




As part of the *Baseline Data*, you indicated the likelihood of MTCT of HIV for women (and neonates) *not receiving* treatment to prevent MTCT. In the screen above, the rate is 39 percent. You cannot alter this assumption without returning to the *Baseline Data Editor*. The ATC requires you to indicate the MTCT rate for women receiving MTCT treatment. Typically, this will be lower than the rate of transmission for women not receiving treatment. In the example above, the transmission rate for women who are HIV+ but treated for MTCT is 13 percent.

### 13.5 ARV TREATMENT: ARV PROTOCOL LINE 2

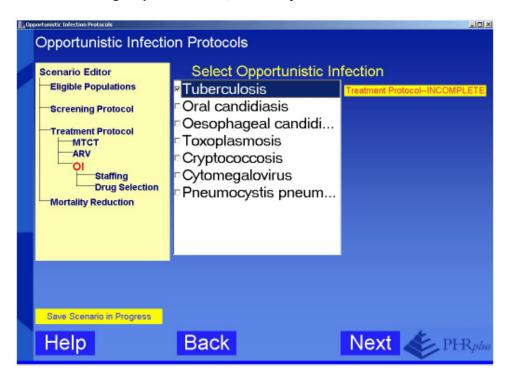
In the example earlier, the ARV treatment scenario was set to only include one line of ARV treatment. However, you could indicate to have two lines of treatment. In that case, the ATC would now require you to specify the second treatment regimen. You do this in exactly the same was as you did the first protocol, adhering to the same restrictions, as in the example screen below.



In the example above, the second line of treatment should consist of 2 NRTI drugs plus one PI drug. (This protocol would not be available in the scenario being defined, simulation\_scenario\_1, because the baseline data does not include PI drugs.) In the screen above, it is assumed that, in a given year, this protocol will cease to be effective for 30 percent of patients receiving the protocol. Finally, the screen indicates the drugs that will be used as part of this line of treatment.

### 13.6 OPPORTUNISTIC INFECTIONS PROTOCOL

To complete a scenario, the treatment protocol for OIs must still be defined. Not all scenarios will treat all OIs. You might want to evaluate the effects of treating only tuberculosis, for example.



- 1. Indicate opportunistic infections that will be treated in the scenario that you define by selecting them in the screen titled *Opportunistic Infections Protocols*.
- 2. Select the button *Treatment Protocol—Incomplete* to enter data.

To test whether your scenario will use too much computer memory, use the following method.

- 1. To each treated opportunistic infection that has both multiple lines of treatment and non-zero attrition for more than one line of treatment (according to your *Baseline Data*,) assign the number 3.
- 2. To each treated opportunistic infection that has attrition but *not* multiple lines of treatment, assign the number 2.
- 3. To each opportunistic infection that has no first-line attrition, assign the number 1.

Your scenario now yields a series of numbers, each of which is the number 3, the number 2, or the number 1. Compute the *product* of this series; if this product is greater than 384, you must change your scenario.

If your Baseline Data indicate that all OIs have both attrition and multiple lines of treatment, your scenario can treat a maximum of four opportunistic infections. Treating more than four infections where there are both attrition and multiple lines of treatment will use too much of your computer's memory.

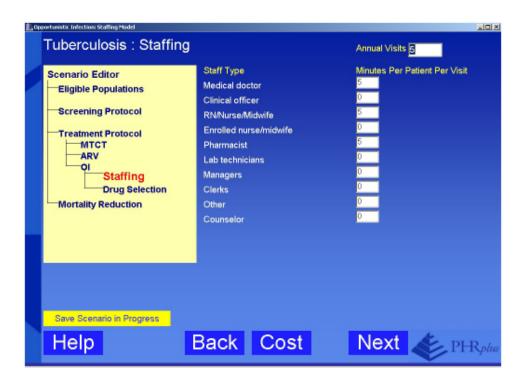
## I 3.7 OPPORTUNISTIC INFECTIONS PROTOCOL: TUBERCULOSIS

- 1. To specify the protocol for treating tuberculosis, you need to indicate:
  - a. The staffing model for treating tuberculosis, and
  - b. The drugs to be used to treat tuberculosis for patients with AIDS.

## I 3.8 OPPORTUNISTIC INFECTIONS PROTOCOL: STAFFING MODEL FOR TUBERCULOSIS

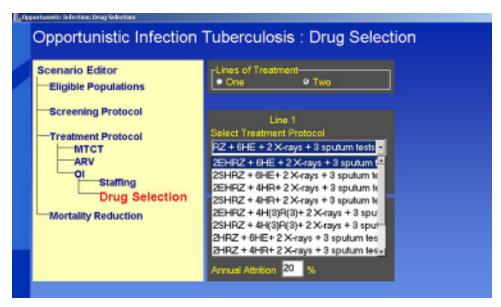
The first screen to appear requires you to specify the Staffing Model.

- 1. Indicate the number of annual visits that patients make in connection with their treatment for tuberculosis.
- 2. Values for the number of visits will be integers greater than or equal to zero.
- 3. Indicate the minutes per patient per visit required of each type of health personnel to treat tuberculosis.
- 4. Values for these data will be time in minutes; their values will be integers greater than or equal to zero.

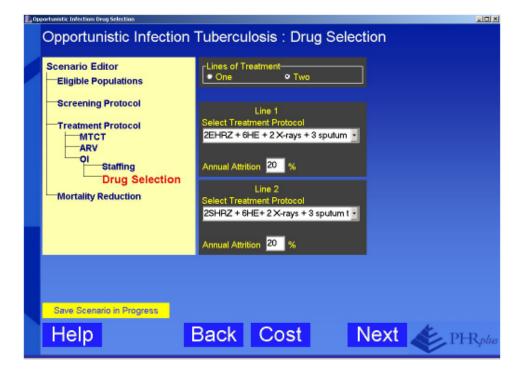


### 13.9 OPPORTUNISTIC INFECTIONS PROTOCOL: DRUG SELECTION FOR TUBERCULOSIS

- 1. Indicate the number of lines of treatment, if your Baseline Data allow for multiple lines.
- 2. Indicate specific drugs using the dropdown menu.



For each line of treatment, indicate a rate of attrition. This is the annual percent of people treated for whom a protocol becomes ineffective.



When you enter *Epidemiological Data* as part of *Baseline Data*, the ATC requires you to indicate a list of OIs that an ARV treatment program might elect to treat. For each such infection, you are required to indicate whether there is treatment attrition associated with the infection and whether there may be multiple lines of treatment. In the example *Baseline Data*, data\_simulation\_1, this was done earlier in the screen below.



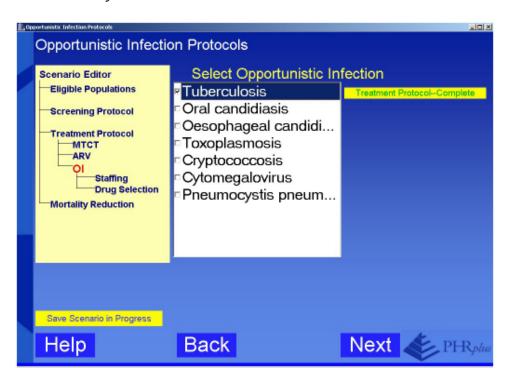
Recall that, in this screen, you are asked to enter "Yes" if an infection is associated with treatment attrition and "No" otherwise. Similarly, the ATC requires you to enter "Yes" if there are multiple lines of treatment for an OI, and "No" if there are not. In the example Baseline Data above, patients treated for tuberculosis do experience attrition and there are multiple lines of treatment.

Entering these data as part of Baseline Data *does not imply* that all scenarios you define must also assume treatment attrition and provide multiple lines of treatment. The *Baseline Data* merely define what is *possible*. You may have the option of assuming attrition and multiple lines of treatment, but the Scenario Editor allows you to assume that attrition is zero percent and that there is only one line of treatment.

Because of this flexibility, you need to indicate, for each OI, the rate of attrition associated with that OI and whether the program that you define will provide multiple lines of treatment.

### I 3. I O OPPORTUNISTIC INFECTION PROTOCOLS: TREATMENT PROTOCOL COMPLETE

After indicating lines of treatment and attrition rates, the ATC indicates that you have completely specified treatment protocols for the opportunistic infections that you elect to treat.



Tie

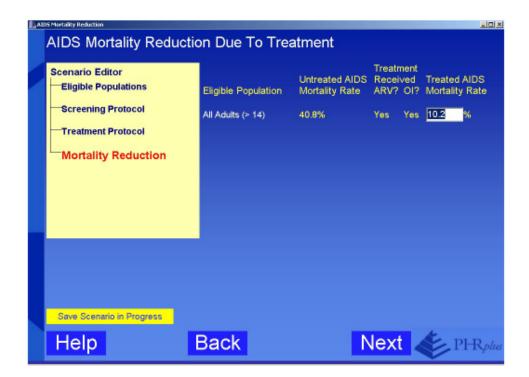
If more than one OI was identified to be treated, the steps described above for tuberculosis would be repeated for each other OI.

### 13.11 AIDS MORTALITY REDUCTION DUE TO

#### TREATMENT

- Enter the percent of the population infected with AIDS and receiving ARV treatment who will, nevertheless, die within one year.
- 2. Enter these data as percents (including fractional percents). All values should lie between zero and 100.

When you enter Baseline Data, you enter an Initial AIDS Mortality Rate, as part of Epidemiological Data. ARV treatment may extend the lives of patients with AIDS and thus lower the AIDS mortality rate. The ATC requires you to indicate the mortality rate for AIDS patients receiving ARV therapy. In the example screen on the next page, the Untreated AIDS Mortality Rate is 40.9 percent, but only 10.2 percent of the treated population will die in a given year.



#### 13.12 SAVE SCENARIO

Once you have completed specifying protocols for treating opportunistic infections, you have completed specifying your scenario as well. When you select *Next*, the ATC gives you the opportunity to save the scenario that you have defined, as well as to view the *Baseline Data* that it employs and to review the assumptions of the scenario itself.

- 1. Enter a name and select Save to save a scenario.
- 2. View *Baseline Data* and *Scenario Assumptions* by selecting appropriate buttons.

Tip

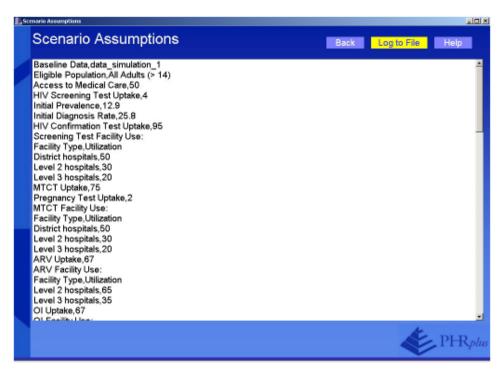
You will enter a (possibly reduced) mortality rate separately for each eligible population—although in this example only one population is treated.

The ATC also assumes that treatment for OIs also implies a reduced mortality rate.

3. Select *Log to File* to create an Excel spreadsheet in the Output directory with a record of *Baseline Data* and *Scenario Assumptions*.



Once you have completely specified a scenario, save it by entering a name in the screen above and selecting *Save*. The ATC will save the scenario in the Scenario sub-directory. You can also review both baseline data and scenario assumptions by selecting the appropriate buttons. When you select *View Scenario Assumptions* in the screen above, for example, the ATC model produces a list of all of the assumptions that you made in the course of defining a scenario.

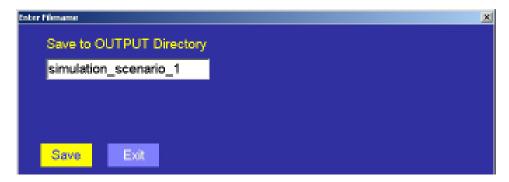


This is difficult to read in its present format; it is easier to read as a Log file.

1. Select Log to File.

By selecting *Log to File* in the screen on the previous page, you can create an Excel spreadsheet in the Output sub-directory that records all of the assumptions in a given scenario.

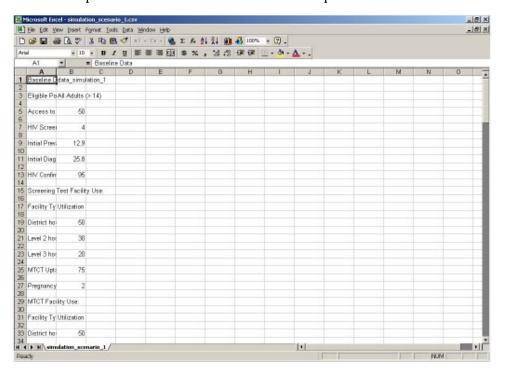
- 2. To create an Excel version of your scenario, select *Log to File* and enter a filename.
- 3. Then select Save.

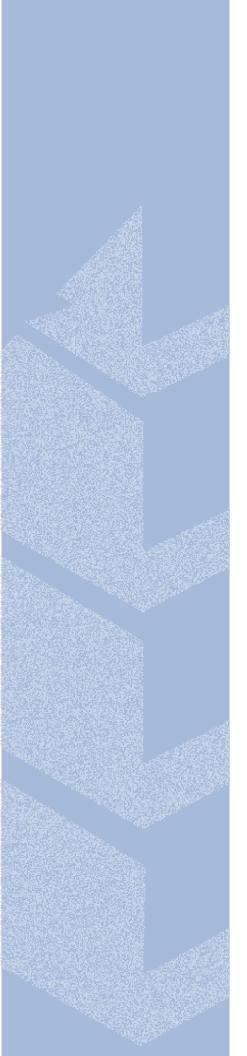


You can then open the file in Excel. Once again, this file will not be easy to read at first.

To make it easy to read:

- 1. In Excel, highlight columns A and B, by placing the cursor on A and moving it across to B while depressing the mouse button.
- 2. Once the columns are highlighted, select *Format, Column*, and *AutoFit Selection*. This will cause the first two columns of the spreadsheet to expand and will make the scenario assumptions readable.





# CHAPTER I 4 MODIFY EXISTING SCENARIO

14.1 Resume Scenario in Progress

## CHAPTER 14 MODIFY EXISTING SCENARIO

Once you have created a scenario, you might want to know how much the ATC's estimates would change, if you were to make slightly different assumptions. One way to do this is to *modify* the scenario that you created, using the *Modify Existing Scenario* function.

1. Select *Modify Existing Scenario* from the AIDsTreatCost *Model* screen.

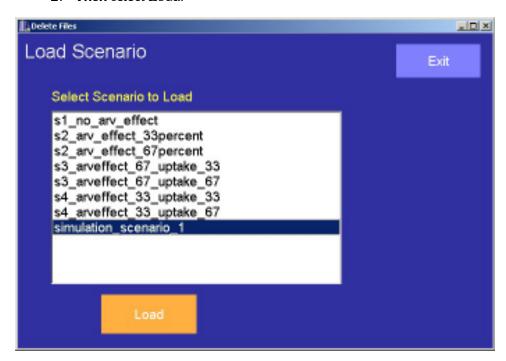


Tip

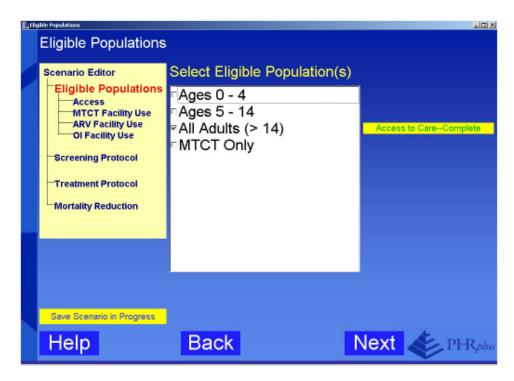
The ATC will allow you to modify details of the scenario but not the baseline data that it assumes.

When you select *Modify Existing Scenario*, the ATC asks you to specify the scenario that you want to modify.

- 1. Select the scenario that you want to modify,
- 2. Then select Load.



Once you have selected a scenario to modify, the ATC will return you to the *second screen* that you encountered when you defined that scenario. It will *not* return you to the first screen, where you select the *Baseline Data* assumed by your scenario.



This fact is important. You can modify a scenario's assumptions but you cannot use Modify Existing Scenario to change the baseline data that a scenario uses. If you select Back in the screen above, the ATC will return you to the screen where you select Baseline Data, but it will not allow you to alter the baseline data.

Modify Existing Scenario can be used only to change aspects of a scenario other than its assumed Baseline Data.

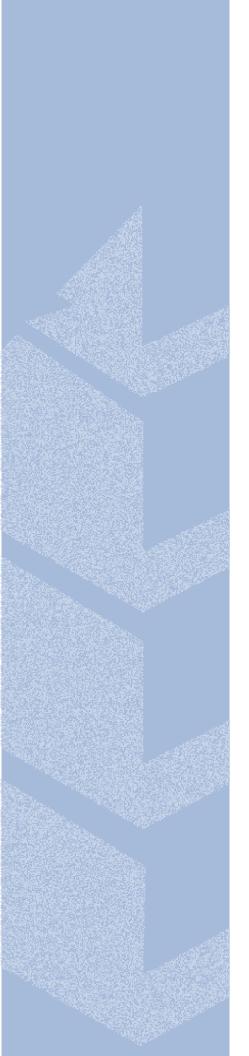
In order to create a new scenario that uses different *Baseline Data*, you must use the *Create New Scenario* function.

### 14.1 RESUME SCENARIO IN PROGRESS

Another convenient function of the ATC is *Resume Scenario in Progress*. While creating a scenario, you may need to end your ATC session before the scenario is complete. If this happens, select *Save Scenario in Progress*—this command is available on every screen in the Scenario Editor. When you return to the ATC, select *Resume Scenario in Progress*. The ATC will return you to the point where you ended.

Tip

If you attempt to change Baseline Data after selecting Modify Existing Scenario and then selecting Back, the ATC will not perform the operation.



## CHAPTER I 5 VIEW SCENARIO OUTPUT

- 15.1 Selecting Scenarios to Evaluate Using the ATC
- 15.2 Using Annual Simulation Steps
- 15.3 View Output: Cost
- 15.4 Total Cost by Input Type
- 15.5 Switching Scenarios
- 15.6 Show Graph
- 15.7 Graphing Options: Select Column
- 15.8 Graphing Options: Select Row
- 15.9 Graphing Option: Stack By
- 15.10 Total Cost by Service Type
- 15.11 Percentage Cost, and Cost Per Person Treated
- 15.12 View Output: Demographic
- 15.13 View Output: Epidemiological
- 15.14 View Output: Treatment
- 15.15 View Output: Elasticity
- 15.16 View Output: Staff Requirements
- 15.17 View Output Spreadsheet, Baseline Data, Scenario Assumptions
  - 15.17.1 View Output Spreadsheet
  - 15.17.2 View Baseline Data
  - 15.17.3 View Scenario Assumptions
  - 15.17.4 Impose Constraints

## CHAPTER I 5 VIEW SCENARIO OUTPUT

1. Select *View Scenario Output* to see the ATC model's evaluation of scenarios that you have defined.

Once you have completely defined a scenario, return to the second screen that you see when you start the model:



## I 5. I SELECTING SCENARIOS TO EVALUATE USING THE ATC

To view output associated with a *single* scenario:

- 1. Select View One Scenario using the cursor,
- 2. Select a scenario from the menu of saved scenarios in the screen titled *Select Scenarios*.

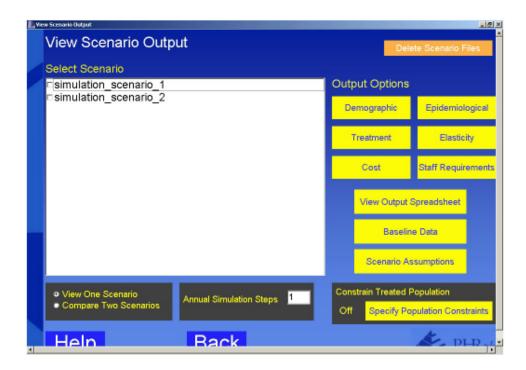
To compare the output from two scenarios:

1. Select View Two Scenarios, again using the cursor,

2. Select two scenarios from the menu of saved scenarios.

The ATC allows you either to view the ATC's calculations for a single scenario or to view its calculations for two scenarios simultaneously. In the screen below, only one scenario is selected to be viewed.

Simulation\_scenario\_1 is the example scenario that has been defined above. For purposes of illustration, a second scenario was also defined, simulation\_scenario\_2. The two scenarios use the same Baseline Data, data\_simulation\_1. Simulation\_scenario\_2 differs from simulation\_scenario\_1 only by adding a second line of ARV treatment, so it should be slightly more expensive, and should imply slightly greater resource requirements.



#### 15.2 Using Annual Simulation Steps

 The Annual Simulation Steps is a function that enables you to more accurately simulate the sequence of services provided in an ARV program and cost these services according to when they occur within a given year and how long a patient will benefit from these services (such as the length of time a patient will receive ARV treatment during the first year of treatment.)

All services of a particular type within a given simulation step are assumed to occur simultaneously, and the different types of services occur in a fixed order. By default, each simulation step is an entire year. This creates errors in the ATC's output. For example, anyone diagnosed in Year 1 can be treated in Year 1 and receives ARV treatment (as well as a reduced mortality rate) for the entire year. However, screening should occur before ARV treatment is provided. In actuality, the typical person diagnosed in Year 1 is

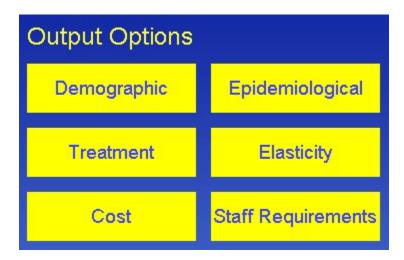
diagnosed in month 6, and should only be treated for half the year. Therefore, the model drastically overestimates the effectiveness, and cost, of the ARV intervention. Similar errors arise for the other services provided.

The magnitude of these errors is in direct proportion to the length of the simulation step. With one simulation step per year, the model is providing the patient with six extra months of treatment which the patient is not actually receiving. With 12 simulation steps per year, the model only overestimates the length of time the patient is treated by two weeks. Increasing the number of annual simulation steps therefore increases the model's accuracy. Using this feature does slightly increase the runtime of the ATC. It can, however, run anywhere from one to 100 annual simulation steps.

### 15.3 VIEW OUTPUT: COST

To view ATC output:

1. Select one of the six *Output Options* in the *View Scenario Output* screen.



After selecting the scenarios whose output you wish to see, select a category from the six above. The ATC generates output regarding any of six categories:

- Demographics
- Epidemiological outcomes
- Treatment
- Elasticity (of total cost with respect to input costs)
- Cost
- Staff Requirements

For purposes of illustration, *Cost* is selected. The ATC then generates a screen with further options. These allow you to see cost data categorized by:

- Input Type and
- Service Type.



### 15.4 TOTAL COST BY INPUT TYPE

An ARV treatment program—a scenario, in the language of the ATC—requires screening and confirmation tests, drugs, capital, labor, and training. All of these are the *inputs* of a treatment program.

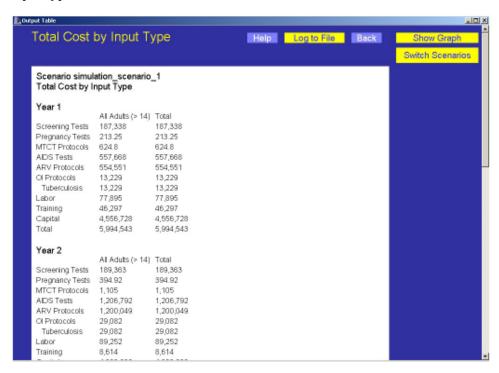
1. To view costs associated with program inputs, select *Input Type* from the screen titled *Select Cost Output Tables*.

When you elect to see costs by Input Type, the ATC asks if you wish to see:

- Total costs,
- Input costs as a percentage of total cost, and
- Cost per person treated.



When you select *Total*, the ATC generates data on total program costs by input type.



As you will notice, the estimated total cost associated with simulation\_scenario\_1 in year 1 is 5,994,543. This is the sum of the component costs listed above this total cost.

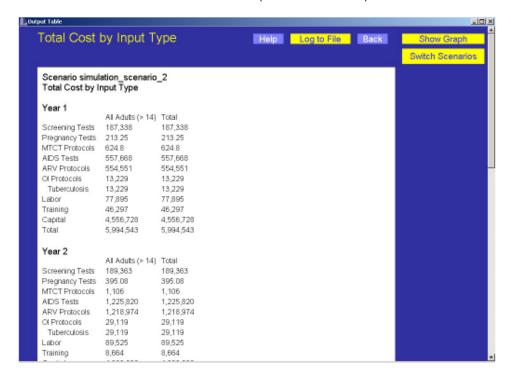
Tip

By scrolling down using the scroll bar on the right, you can see ATC cost data by input type for years 1 through 5.

### 15.5 SWITCHING SCENARIOS

When comparing two scenarios, use the *Switch Scenarios* option (upper right in the screen below,) to view output for your second scenario.

In the table on the previous page, however, only the data for simulation\_scenario\_1 is shown. To view output for simulation\_scenario\_2, select *Switch Scenarios* in the screen on the upper right. This will generate a new set of tables for the latter scenario (as shown below.)

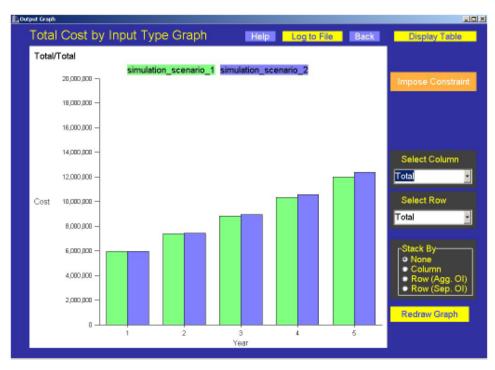


You will observe that this scenario has the same total cost in year 1 as did simulation\_scenario\_1. Costs associated with the two scenarios begin to differ only in year 2.

### 15.6 SHOW GRAPH

- 1. To view data graphically, select *Show Graph* (upper right in screens with tabulated data).
- 2. To compare scenarios graphically, select *Show Graph* in either of the two screens presenting data in tabular form. The ATC will then graph the two scenarios together.

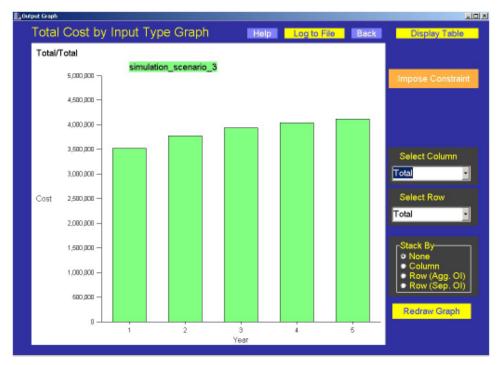
In the graph below observe that the two scenarios have the same total cost in year 1. Over time, the difference in cost between them increases.



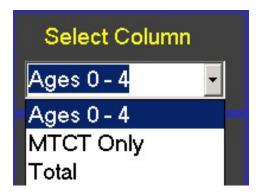
### 15.7 GRAPHING OPTIONS: SELECT COLUMN

1. To graph data for one eligible population—as opposed to data across all eligible populations—use the dropdown menu beneath *Select Column* to choose one population to examine, then select *Redraw Graph*.

The ATC will allow you to graph your data—in this case cost data—for a single eligible population treated in your scenario. To illustrate this fact, a third scenario, simulation\_scenario\_3, was created. This scenario includes two eligible populations: children aged 0-4 and MTCT Only. The ATC can graph this scenario by estimating the total cost associated with simulation\_scenario\_3 across both eligible populations. This generates the graph on the next page.



To graph total cost for a single population, use the dropdown menu on the right. This allows you to view data for each of these populations separately.



Here, the population aged 0-4 is selected.

By selecting *Redraw Graph*, the ATC generates the graph of the total costs for the 0-4 age group. Note that total costs associated with this age group are less than the total costs of the entire treatment program, as one would expect them to be.



### 15.8 GRAPHING OPTIONS: SELECT ROW

- 1. To graph data for one input—as opposed to data across all inputs—use the dropdown menu beneath *Select Row* to choose one input to examine
- 2. Then select Redraw Graph.

Returning to simulation scenarios 1 and 2, these involve a range of input types. Selecting the dropdown menu beneath *Select Row* gives a list of these types.



By selecting *ARV Protocols* from this menu, the ATC graphs the costs of ARV protocols for the two scenarios. Recall that simulation\_scenario\_1 has a total cost of nearly \$6 million in year 1. Observe that the year 1 cost associated with ARV protocols is much less than this.



### 15.9 GRAPHING OPTION: STACK BY

- 1. To represent costs graphically by their components, use the *Stack By* option.
- 2. To represent eligible populations as components of cost, select *Stack by Column*.
- 3. To represent inputs (services) as components of cost select *Stack by Row*

It is useful to see total cost, for example, broken down into its components. There are two ways to do this. First, you can disaggregate total cost by populations treated. In the third scenario, simulation\_scenario\_3, for example, there are two such populations. Second, you can disaggregate total cost by input type.

To disaggregate costs by population, select *Stack by Row*. Using the simulation\_scenario\_3, the ATC graphs total cost, indicating the components of total cost associated with the two treated populations.



Observe here that the population aged 0-4 accounts for the dominant part of total cost in all years over which the ATC makes projections.

1. To disaggregate costs by input, select *Stack by Row*. You can do this either by aggregating the costs of treating OIs into a single cost—use *Row(Agg. OI)* to do this—or by separating the costs associated with each OI that your scenarios treat—use *Row(Sep.OI)*.

Returning to simulation\_scenario\_1, the following is a graph of total costs by input type. This scenario treats only one OI. Therefore, the costs for OIs are not disaggregated.



### 15.10 TOTAL COST BY SERVICE TYPE

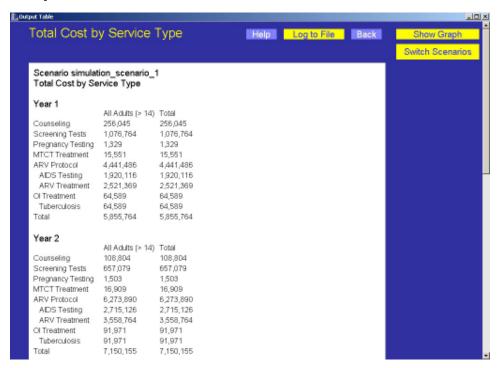
- 1. To graph costs by service type, select *Service Type* from the screen titled *Select Cost Output Tables*
- Service types include:
- Counseling,
- Screening,
- Pregnancy Testing,
- MTCT Treatment,
- ARV Treatment,
- AIDS Tests, and
- Treatment for OIs.

Earlier, output was viewed by input type by making the relevant selections in the screens below.





However, the total costs can also be graphed by Service Type. In this case, the components of total cost will be services rather than inputs. By selecting *Service Type* and *Total* in the screens above, total cost is disaggregated by the services provided in simulation\_scenario\_1, for example.



As before, total cost can be graphed by service type, by selecting the *Show Graph* option in the screen above.



The graph on the previous page is just the graph of total cost by service type; it does not break total cost into component costs associated with specific services. By selecting the *Stack By Row* option, you can observe the total costs by various services in simulation scenarios 1 and 2.



It is apparent here that, apart from capital, AIDS testing and ARV Treatment are the largest components of total cost in simulation\_scenario\_1, and that their share of the total costs appears to increase over time.

If you would want to estimate the costs for treating 10,000 people, the above method will work. However, the complication in the method is that you must be sure that enough people are screened to get the 10,000 treated. That may prevent you from limiting the number screened to any arbitrary number. In fact, this limitation reflects the nature of the real world: to diagnose 10,000 patients, you need to screen more than that unless the prevalence of disease is essentially 100 percent in your population.

## 15.11 PERCENTAGE COST, AND COST PER PERSON TREATED

- 1. To view costs associated with an ARV treatment program as a percentage of total cost, select *Percentage* from the *Select Cost Type* screen.
- 2. To view the cost per person treated associated with an ARV treatment program, select *Per Person Treated* from the *Select Cost Tupe* screen.

In the examples above, only the total cost associated with an ARV treatment scenario is considered. The ATC allows you to view the costs as a percentage of total cost and cost per person treated for an ARV treatment program. To view costs presented in these ways, return to the *Select Cost Type* screen and choose the form in which you wish the ATC to present its cost calculations.

For any scenarios that you define, you can graph costs as a percentage of total cost, and the cost per person treated. The graphing options here are essentially identical to the ones that were described above, in connection with graphing total cost.

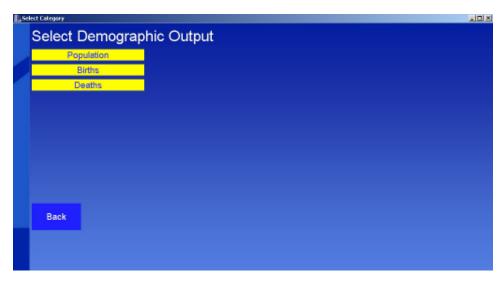
#### 15.12 VIEW OUTPUT: DEMOGRAPHIC

In addition to estimating the cost of treating HIV/AIDS, the ATC estimates population size, total births and total deaths over five years.

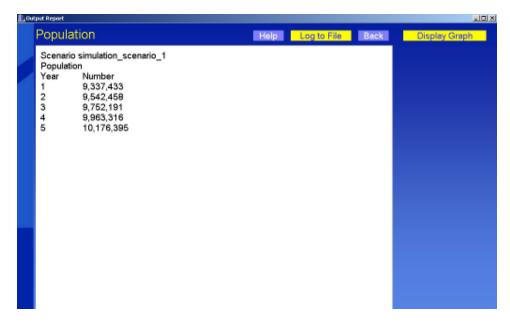
- 1. To view demographic projections in the ATC, select *Demographic* from the *View Scenario Output* screen.
- 2. Then select Population, Births, or Deaths to view data in table form.
- 3. Select Display Graph to view data graphically.



The ATC then generates a new screen in which you can select the type of demographic data that you wish to view.



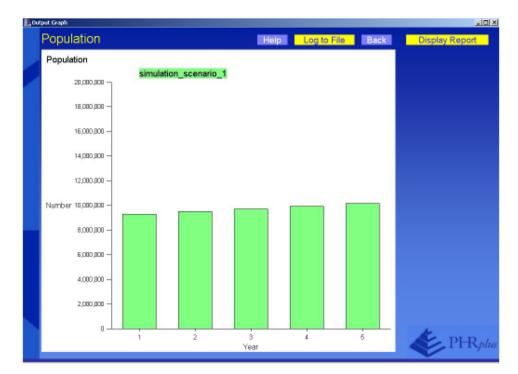
For illustration, *Population* was selected. This selection causes the ATC to generate five-year projections of total population for the country of interest in simulation\_scenario\_1.



These data appear at first in tabular form.

1. To graph the data in the table above, select Display Graph.

Below are the data from simulation\_scenario\_1.



As you can see in this graph (and the table preceding), the population in simulation\_scenario\_1 changes very little over the five years of the ATC's projections.

#### 15.13 VIEW OUTPUT: EPIDEMIOLOGICAL

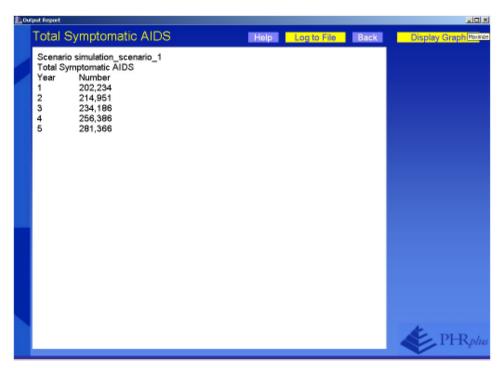
- 1. To view epidemiological output, select *Epidemiological* from the *View Scenario Output* screen,
- 2. Then select one of the options in the *View Epidemiological Output* screen.
- 3. To view epidemiological output graphically, select Display Graph.

The ATC also estimates data regarding the epidemiology of HIV/AIDS, using baseline data as well as assumptions that you make in the course of specifying a scenario. The ATC will give you a list of the types of epidemiological output you can view. These include:

- New Infections,
- New AIDS (cases),
- Total HIV+ (population),
- Total AIDS (population),
- AIDS Deaths,
- Births to HIV+ Mothers, and
- HIV+ Births.

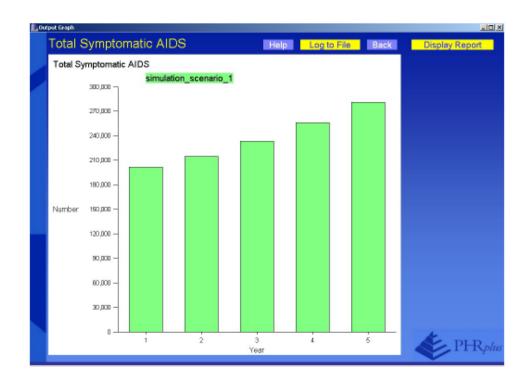


For illustration, *Total AIDS* was selected. The ATC then produces a five-year projection of the number of individuals with AIDS in the population of simulation scenario 1.



As in other cases, you can graph these data by selecting the *Display Graph* option.

As you can see from the graph of this example, the total population with AIDS rises by approximately 39 percent from just over 200,000 in year 1 to just over 280,000 in year 5. The ATC allows you to view any other epidemiological data in a similar way.



#### 15.14 VIEW OUTPUT: TREATMENT

- 1. To view ATC output regarding the number of individuals diagnosed, or the number receiving treatment in the scenario that you define, select *Treatment* in the screen titled *View Scenario Output*.
- 2. Then select the specific output that you wish to view from the *Select Treatment Output* screen.

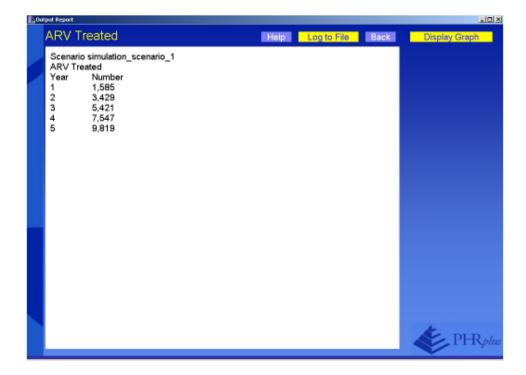
Any scenario specifies populations eligible for screening and treatment, as well as the treatments for which they are eligible. The ATC estimates the number of individuals that are screened and treated in the scenario that you define. The outputs include:

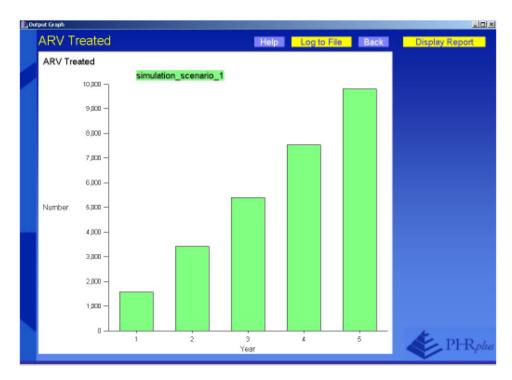
- Screened (number),
- New Diagnosed,
- Total Diagnosed,
- Pregnancy Tests,
- MTCT Treated,
- ARV Treated, and



OI Treated.

For illustration, *ARV Treated* was selected in the screen above. As in other cases, the ATC first generates output in table form. In the table below, the total population receiving ARV treatment rises from just over 1,500 in year 1 to just under 10,000 in year 5 of the ATC's projections. The rapid rise in the number receiving treatment in simulation\_scenario\_1 is made vivid in





the graph on next page.

#### 15.15 VIEW OUTPUT: ELASTICITY

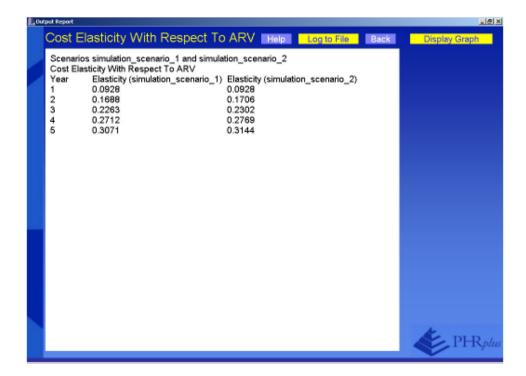
- 1. To view elasticities, select *Elasticity* from the *View Scenario Output* screen.
- 2. Then select specific elasticities to view.
- 3. Graph elasticity data by selecting Display Graph.

The ATC computes *cost elasticities*. Cost elasticity is the percentage change in total cost associated with a 1 percent change in the cost of a given service. Elasticities indicate the extent to which changing the cost of a single input will affect the total cost associated with the ARV treatment. For example, the ATC will estimate the percentage change in total cost associated with a 1 percent change in the cost of:

- Screening,
- Pregnancy Tests,
- MTCT treatment,
- AIDS tests,
- ARV treatment, and
- OI treatment.



These options appear in the screen titled *Select Input for Cost Elasticities*.



For purposes of illustration, *ARV* was selected. This will cause the ATC to calculate the percentage change in total cost associated with a one percent change in the cost of ARV treatment.

In the table above, a one percent change in the cost of ARV treatment is associated with an approximately 9 percent change in the total cost of the program in year 1 of the program defined by either simulation\_scenario\_1 or simulation\_scenario\_2. This means that changes in the unit cost of ARV

treatment have a substantial effect on the overall cost of the ARV treatment program specified by these scenarios.

#### 15.16 VIEW OUTPUT: STAFF REQUIREMENTS

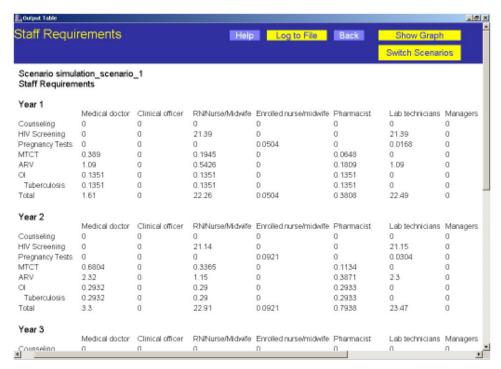
- 1. To view staff requirements associated with an ARV treatment program, select *Staff Requirements* from the *View Scenario Output* screen.
- 2. To view numbers of staff required, select *Personnel* in the *Select Staff Requirements* screen.
- 3. To view total labor costs associated with staff requirements, select *Cost* in the *Select Staff Requirements* screen.
- 4. To compare data on two scenarios, use the *Switch Scenarios* button, to toggle back and forth between scenarios.

Any ARV treatment program that you define will require labor of various types to staff the program. For example, it will require physicians, nurses, pharmacists, lab technicians and other staff. Indeed, when you specify your Baseline Data, you will list the types of staff that an ARV program might require. In View Output: Staff Requirements, the ATC allows you to see how many physicians, nurses, and other staff would be required in the scenarios that you define. It also allows you to view their associated costs,



disaggregated by type of staff.

After selecting Staff Requirements in the View Scenario Output screen,



select Personnel in the screen below.

Selecting *Personnel* in this screen causes the ATC to indicate the types of staff required by the scenarios that has been defined.

The screen above shows that simulation\_scenario\_1 requires a total of 1.61 medical doctors in year 1 of the ATC's projections. This number may seem small, but simulation\_scenario\_1 entails that only about 1,500 patients receive ARV treatment in year 1. Furthermore, the assumed physician time per patient is small. This means that fewer than two full-time physicians would be required to treat 1,500 patients in a single year. Scenarios that

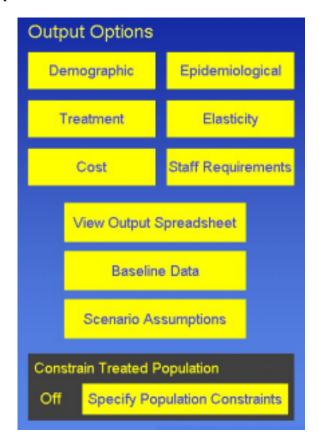
assumed a larger treated population or more physician time per patient would require a larger number of physicians.

### I 5.17 VIEW OUTPUT SPREADSHEET, BASELINE DATA, SCENARIO ASSUMPTIONS

#### 15.17.1 VIEW OUTPUT SPREADSHEET

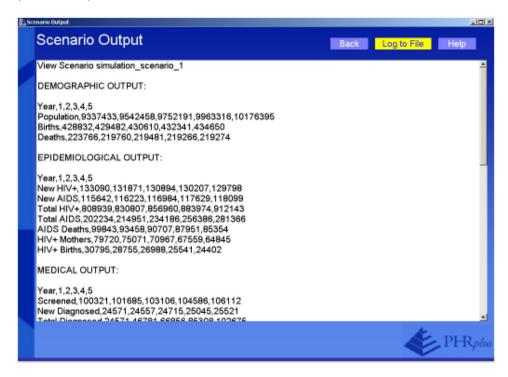
- 1. To view ATC output (other than cost data) in a single spreadsheet, select *View Output Spreadsheet* from the *View Scenario Output* screen.
- 2. To view *Baseline Data* for a saved scenario, select the scenario and then select *Baseline Data*.
- 3. To view the assumptions that comprised an already saved scenario, select the scenario, and then select *Scenario Assumptions*.
- 4. To view data more easily, after selecting *View Output Spreadsheet*, *Baseline Data*, or *Scenario Assumptions*, select *Log to File* and save the ATC spreadsheet. Then view the data in Excel.

The six options that are available have been reviewed. These were the



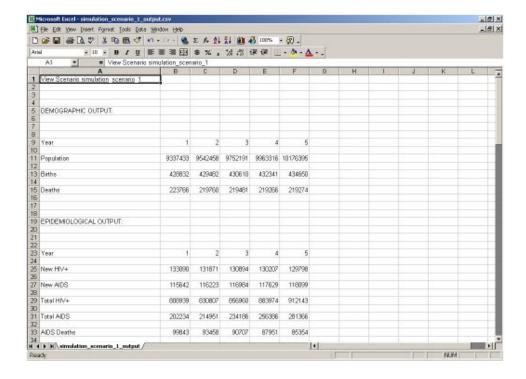
six output categories—Demographic, Epidemiological, Treatment, Elasticity,

Cost, and Staff Requirements—visible in the View Scenario Output screen (See below.)



In addition to these six options, there are four others. The first additional option, *View Output Spreadsheet*, allows you to see most ATC output in a single spreadsheet. To see output thus displayed, select this option. The ATC will then generate an ATC spreadsheet.

This is a little difficult to read. To display this in better format:



- 1. Select Log to File.
- 2. Enter a file name.
- 3. Select *Save*—the ATC model will save the spreadsheet in Excelcompatible format in the Output subdirectory.

Selecting Log to File asks the ATC model to save data in spreadsheet format in the Output subdirectory. This will be a .csv file that you can open in Excel. When you open the resulting saved file in Excel, you see a spreadsheet with all of the ATC model output data.

#### 15.17.2 VIEW BASELINE DATA

- 1. To view the *Baseline Data* underlying an already saved scenario, select the scenario in the *View Scenario Output* screen. The ATC will generate an ATC spreadsheet.
- 2. To view the same data more easily in Excel, select Log to File.
- 3. Enter a file name and select *Save*. The ATC will save the *Baseline Data* in an Excel spreadsheet in the Output directory.

You can view the *Baseline Data* associated with an already saved scenario in exactly the same way that you view an output spreadsheet. To do this, simply return to the *View Scenario Output* spreadsheet and select *Baseline Data*. As before, the ATC will generate an ATC spreadsheet. This will contain the complete baseline data that the scenario uses. To view this a little more conveniently, select *Log to File*, enter a filename, and select *Save*. The ATC will save the *Baseline Data* in an Excel file in the Output directory.

#### 15.17.3 VIEW SCENARIO ASSUMPTIONS

- 1. To view the assumptions associated with a single scenario, select that scenario in the *View Scenario Output* screen. The ATC will generate an ATC spreadsheet.
- 2. To view the same data more easily in Excel, select Log to File, then
- 3. Enter a file name and select *Save*. The ATC will save the spreadsheet in Excel-compatible format in the Output directory.

You can view the assumptions associated with an already saved scenario in exactly the way that you view *Baseline Data*. To do this, return to the *View Scenario Output* spreadsheet and select *Scenario Assumptions*. As before, the

ATC will generate an ATC spreadsheet. This will contain the complete set of assumptions that define your previously saved scenario. To view this a little more conveniently, select *Log to File*, enter a filename, and select *Save*. The



ATC will save the Baseline Data in an Excel file in the Output directory.

#### 15.17.4 IMPOSE CONSTRAINTS

Recall our graph of total cost by input type.

Note the button title *Impose Constraint* at upper right in this screen.

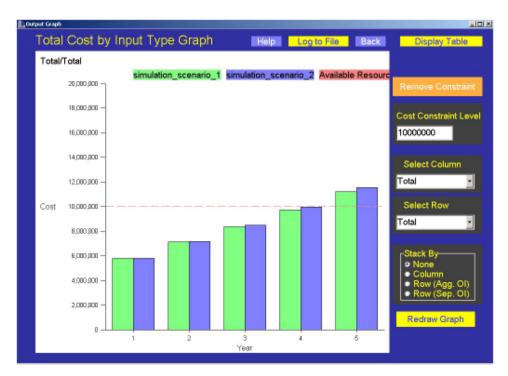
- 1. To view the difference between resources and predicted costs, select *Impose Constraint*.
- 2. Enter Cost Constraint Level.
- 3. Select Redraw Graph.

In the graph above, the total cost associated with either scenario rises from just under 6 million to just over 12 million. When you graph total and other costs, you may be interested in the relationship between costs as forecasted by the ATC and financial resources that actually will be available in



the country.

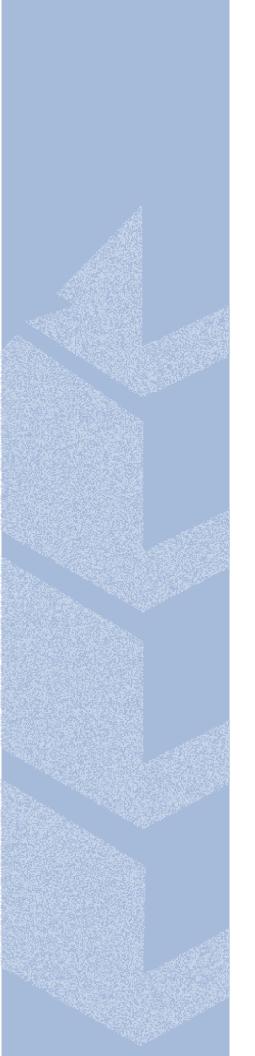
To see this difference graphically, select *Impose Constraint* in the screen above (or similar screens.) The ATC will then ask you to enter a constraint



level.

Note the box at right in this screen titled *Cost Constraint Level*. For illustration, 10,000,000 was entered and *Redraw Graph* was selected. The ATC then represents this constraint in the graph.

In this example, if the budget were constrained to 10,000,000 currency each year, the predicted cost of treating AIDS would begin to exceed this level in year 4 for scenario\_2. The predicted total cost associated with both



## CHAPTER I 6 CONSTRAIN TREATED POPULATION

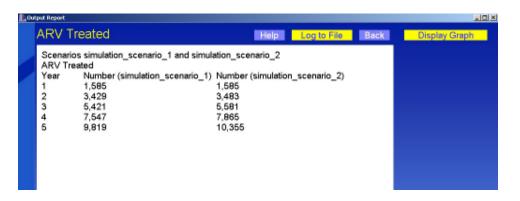
- 16.1 Evaluating a Scenario With Constraints on the Number Treated16.1.1 Binding Constraints16.2 Using the ATC to Generate Estimates for a Population of Fixed Size
- 16.3 Two Methods for Using the ATC to Generate Estimates for a Population of Fixed Size

### CHAPTER 16 CONSTRAIN TREATED POPULATION

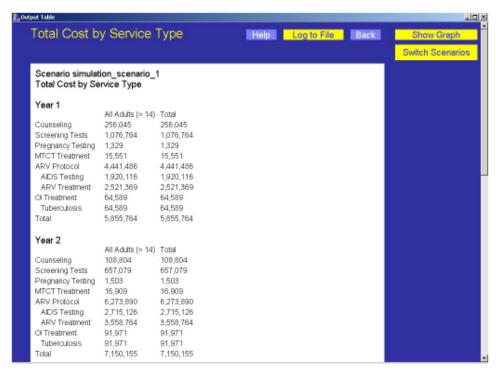
## I 6. I EVALUATING A SCENARIO WITH CONSTRAINTS ON THE NUMBER TREATED

- 1. To evaluate or compare scenarios while constraining the size of the treated population, select *Specify Population Constraints* from the *View Scenario Output* screen.
- 2. Then indicate the services for which you want constraints to apply.
- Specify the constraints—i.e., indicate the maximum number of individuals to be treated. This may be entered as one fixed value for all five years, or as a different value for each of the five years.
- 5. Select Back and view output.
- 4. To clear constraints that you have imposed, return to the View Scenario Output screen, select Specify Population Constraints, and select Clear Population Constraints.

Earlier, the number of people receiving ARV treatment rises from 1,585 in year 1 to 9,819 in year 5 in simulation\_scenario\_1. It rises from the same 1,585 in year 1 to just over 10,000 in year 5 in simulation scenario 2.



The ATC estimates the costs associated with a given scenario using its estimates of the total number to be treated. Other things being equal, scenarios that treat fewer patients will have lower associated costs. Recall the total costs associated with scenario 1. As shown below, the total cost associated with this scenario was roughly 5.8 million in year 1, rising just over 7.1 million in year 2.



You might wish to know the cost associated with a given scenario, or pair of scenarios, assuming that the number treated is capped at some maximum. For example, you might ask what would be the costs associated with simulation \_scenario\_1, if it is assumed that a maximum of 2,000 patients receive ARV (or some other) treatment in each of the five years over which the ATC makes its projections.

#### 16.1.1 BINDING CONSTRAINTS

In the *Treatment* output for simulation\_scenario\_1, fewer than 2,000 people receive treatment in year 1, but more than 2,000 people receive ARV treatment in each year thereafter. This means that a constraint of 2,000 receiving ARV treatment would *not bind* in year 1, but it *would bind* in subsequent years. A constraint is said to *bind* for a given scenario in a given year if it restricts the number treated to fewer patients than would be treated without the constraint.

If you use the ATC to estimate costs assuming a cap of 2,000 treated, the costs associated with year 1 should remain as they are, but the costs for subsequent years should fall. This reflects the fact that the constraint would not bind in year 1 but would thereafter.



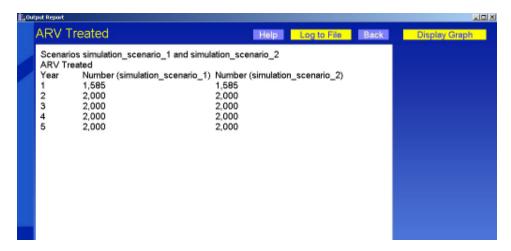
1. To impose the cap, return to the View Scenario Output screen.

- 2. Next, select *Specify Population Constraints*. This causes the ATC to generate a new screen, where you can indicate which treatment populations are to be constrained. In this screen, it is indicated that only 2,000 people receive ARV treatment. Note that the "fixed" option of one constraint for all five years is being used rather than the "variable" constraint of a different constraint for all five years.
- 3. Select Back to return to the View Scenario Output screen.

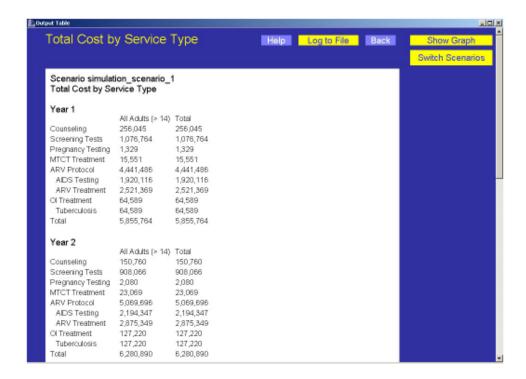


If you check the number receiving treatment in *View Output: Treatment*, you can see, as expected, that the patient population is 1,585, but 2,000 for all subsequent years, where the constraint binds.

Next, you can compare the total cost associated with the two scenarios thus constrained.



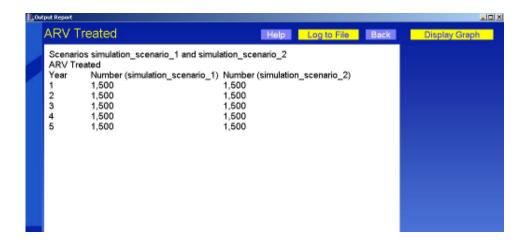
Notice that the year 1 costs associated with scenario 1 remain just over 5.8 million. This reflects the fact that the constraint on the treated population does not bind in the first year for this scenario. But in year 2, the total cost associated with scenario 1 is 6.2 million—down from the previous 7.1 million when the scenario was not constrained.



### 16.2 Using the ATC to Generate Estimates FOR A POPULATION OF FIXED SIZE

 To use the ATC to generate cost and other estimates for a population of a fixed size, specify constraints that bind in all years.

Policymakers often want to know what it would cost to treat a patient population of a fixed size. For example, they might want to know what would be the cost associated with a program that screened an unlimited number of people every year, but would treat a maximum of 1,500 AIDS patients. If no constraints are specified, simulation\_scenario\_1 assumes that 1,585 people are treated in year 1 and more than this are treated in each subsequent year. This means that a constraint of 1,500 people treated will bind in year 1 and that the ATC will estimate costs as though 1,500 people receive ARV treatment in all years. Indeed, this is what happens if you check the number of people treated.

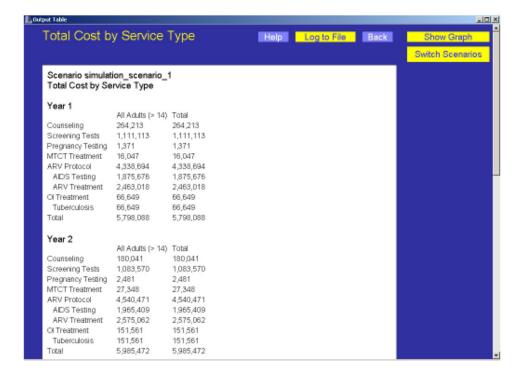


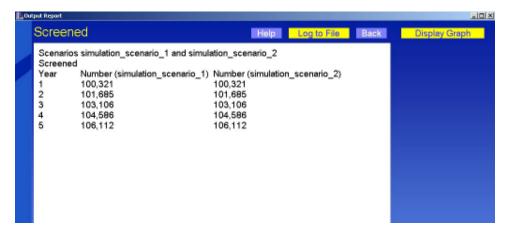
You would expect this to reduce the costs associated with scenarios 1 and 2. To verify that this is true, you can use the ATC to check total costs. For illustration, it is sufficient to see the costs associated with simulation\_scenario\_1. Recall that, before the constraints were imposed, the total cost of this scenario for years 1 and 2 were roughly 5.8 million and 7.1 million, respectively.

In the screen below, the cost for both years is lower, once the size of the population receiving ARV treatment is restricted to 1,500.

Tip

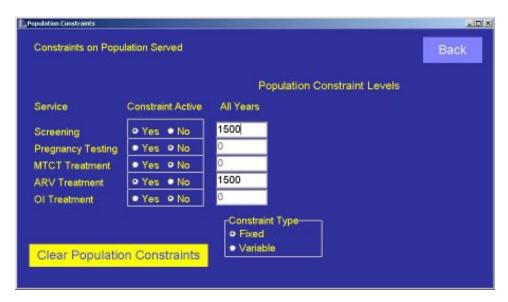
If you impose constraints on the number screened that are too low, other constraints may not bind, and the ATC will no longer generate estimates for a population of fixed (or desired)



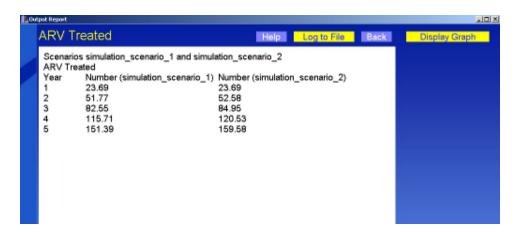


When imposing a constraint on the size of the population receiving ARV therapy, you might also have imposed a similar constraint on the size of the population receiving screening services.

Here it is assumed (i) that a maximum of 1,500 will be screened and (ii) that a maximum of 1,500 will receive ARV therapy. In simulation\_scenario\_1, both of these restrictions bind in all years. But, once the number screened is constrained to 1,500, the ATC estimates that many fewer than 1,500 will be treated in each year.



The reason for this is easy to see. The ATC assumes that only people who have been diagnosed will be treated. In any population of 1,500, there will be many fewer who are HIV+ and still fewer who have AIDS. In order to diagnose 1,500 with AIDS, you would need to screen many more than 1,500 people. This means that, if you impose a constraint of 1,500 on the number screened, the ATC will estimate that many fewer than that will be diagnosed with AIDS and receive ARV therapy.



Note that an exactly similar point is true for services other than ARV therapy.

# 16.3 Two Methods for Using the ATC to Generate Estimates for a Population of Fixed Size

- The following is a first method for estimating ATC output for a population of any fixed size. Assume that you want to know what it would cost to:
  - Screen everyone,
  - Treat 10,000 patients for MTCT,
  - Treat 10,000 patients with AIDS, and
  - Treat 1,000 with opportunistic infections.

Assume that there are at least 10,000 HIV+ women who give birth each year in your population, 10,000 patients who have AIDS and 1,000 more with OIs. In that case, if you screen everyone—i.e., if the screening uptake rate is 100 percent—you will identify all of the HIV+ women who will give birth. You will also identify all of the patients with AIDS, and therefore also those with OIs. Assume that everyone who is diagnosed accepts treatment—i.e. that the uptake rates for MTCT, ARV and OI treatments are 100 percent. Then, by constraining your treatment regimes in the way listed above, you will treat exactly 10,000 for MTCT and AIDS, and 1,000 for OIs.

(Note that you can avoid the assumption that everyone gets screened by adjusting the diagnosis rate to 100 percent to get the sample of the size that you desire.)

 The following is another more general method to treat a fixed size population. The key subtlety in this method is making sure that you screen enough people. This will ensure that the population to be treated will be at least as big as the number that you are interested in.

Let k and n be numbers. Assume that you want to know the costs and resources requirements associated with screening exactly k patients and treating exactly n—for an already saved scenario that screens more than k and treats more than n.

- Identify the types of treatment for which you want to restrict the population. In each case, check to see that screening k people in your eligible populations will imply that at least n people are diagnosed.
  - a. If you want to restrict Screening services, check to see that there are at least *k* individuals in the populations that your scenario declares eligible.
  - b. For each treatment where you want to treat *n* patients, check to see that by screening *k* you will diagnose at least *n*.
  - c. If you want to restrict Pregnancy Testing, check to see that in

- your eligible population, at least n fertile females will be diagnosed HIV+.
- d. If you want to restrict MTCT treatment, check to see that there are at least *n* HIV+ females in your eligible populations who will be diagnosed and have a birth in any given year.
- e. If you want to restrict ARV treatment, check to see that there are at least *n* individuals in your eligible populations who will be diagnosed with AIDS.
- f. If you want to restrict OI treatment, check the population and prevalence of OIs, to see that in your eligible populations, at least *n* individuals will be diagnosed with OIs.

#### Modify your scenario by setting:

- 1. The access rate to 100—this means that everyone has access to health screening.
- 2. All uptake rates to 100—this means that everyone who is eligible for screening or treatment services accepts them.
- 3. The Diagnosis Rate equal to the prevalence rate.
- 4. For each treatment that you wish to restrict, set the constraint accordingly.

The above method will work for estimating the cost, for example, of treating 10,000 people. The complication in the method is that you must be sure that you have screened enough people to get the 10,000 treated. That prevents you from limiting the number screened to any arbitrary number. In fact, this limitation reflects the nature of the real world: to diagnose 10,000 patients, you need to screen more than that unless the prevalence of disease is essentially 100 percent in your population.



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